DIEMERBROECK'S
ANATOMY
—
TREATISE ON
SMALL-POX
AND MEASLES.
—
TRANSLATED BY SALMON

1694

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THE

ANATOMY

OF

Human Bodies;

Comprehending the most Modern

DISCOVERIES

AND

CURIOSITIES

In that ART.

To which is added

A Particular Treatise

OF THE

Small-Pox & Measles.

Together with several PRACTICAL

OBSERVATIONS

AND EXPERIENCED

CURES.

With 139 FIGURES curiously cut in Copper, Representing the several Parts and Operations.

Written in *Latin* by ISBRAND de DIEMERBROECK, Professor of *Physick* and *Anatomy* in *Utrecht*.

Translated from the last and most correct and full *Edition* of the same, By *WILLIAM SALMON*, Professor of *Physick*.

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THE PREFACE.

HOW beneficial the exact knowledge of the Fabrick of humane Bodies is, and how difficult the ſame skill is to attain, the continual improvements in Anatomy one Age after another, notwithſtanding the utmoſt diligence of the laſt, do ſufficiently evince. Were it not beneficial, ſo many Philophers and Phyſicians in all Ages had not employ'd their pains about it; and were it not difficult, ſome or other of theſe great Men had compleated it. Of which number we may reckon *Democritus* and *Hippocrates*, the two Parents of ſolid Philoſophy and Phyſic, one of which great Men was by the City of *Abdera* invited to take a Journey to cure the other of Madneſs; but the Phyſician finding the Philoſopher intent upon his Anatomical ſcrutiny for the ſeat of the Bile, and receiving wiſe Anſwers to all his other enquiries, returned ſatisfied that the multitude of that place laboured of the very Diſeaſe, which they were ſo mad to have cured in *Democritus*.

Many more great Men among the Antients, ſuch as *Ariſtotle*, *Diocles*, *Eraſiſtratus*, *Praxagoras*, *Herophilus*, *Aſclepiades*, *Euripho* and others cultivated this Province; but none in former Ages excelled *Galen*.

Nor was Anatomy in eſteem only among Philoſophers and Phyſicians; but even Kings and Emperors were both Spectators of, and Actors in it. *Alexander* the greateſt of Emperors, employ'd both himſelf and his Maſter *Ariſtotle* ſometimes in Diſſections, notwithſtanding his Conqueſts and great Affairs, which took up ſo much of his time and care. Alſo the beſt of Emperors, *Marcus Antoninus*, who was ſo prudent and wiſe a Man, gave himſelf to the ſearch of Nature and to cutting up of humane Bodies, that he might the better underſtand his own

Frame and Conſtitution. Nor did ſeveral *Ægyptian* Kings diſdain to manage the Anatomical Knife with their own Royal hand.

Certain alſo it is, that *Boethus* and *Paulus Sergius* the *Roman* Conſuls, and other great Perſonages, both Learned and Warlike, honored *Galen* with their preſence at his Anatomical Adminiſtrations; where they might ſee and admire the skill and workmanſhip of the Divine hand in building a Tabernacle for the Soul of Man.

And indeed among all the advantages of Learning, none is greater than to have skill in Nature; and yet above all, the higheſt pitch of knowledge is to know our ſelves. Be he Philoſopher, Orator, Lawyer or Divine, that thinks he knows ſo much, to what purpoſe is it, if he is wiſe abroad and a fool at home, if he knows not the Habitation of his Soul, the ſeat of his Reaſon, whereby he is willing to diſtinguiſh himſelf ſpecifically from Brutes, and ſignally from the moſt of Men? What an exquiſite piece of folly would it appear to be, if a Man skill'd in Minerals and Plants, and in moſt other ſubjects of Natural enquiry, yet ſhould not know the Animal Oeconomy at all? Certainly he would to judicious Eyes appear no leſs impertinent, than the Man that ſhould mind every Mans buſineſs but his own, and in balancing Accounts would be found as rich in knowlege, as the foreſaid impertinent would be in Eſtate.

For Anatomy is not a knowlege only honorable and pleaſant; but profitable and highly uſeful, eſpecially to a Phyſician; ſo neceſſary, that the Ancients thought it the very Foundation upon which the celebrated Art of Phyſic is built, which being once taken away, the whole Art muſt fall to ruine.

As an Architect, when he goes to repair a decay'd Houſe, muſt of neceſſity know all the Parts of the Houſe, of what ſubſtance they muſt be, of what figure, how many in number, and how they muſt one be joyned to another. So he that

profeſſes

professes Physic, can never cure the diseased Parts aright, unless he has an exact *Idea* of their substance, figure, bulk, number, and mutual connexion one to another, which can only be attained by Anatomy.

If a Philosopher ask a Reason of any action either Natural or Animal, it is only the knowledge of the Parts of a Humane Body, that can furnish a Man with an Answer. And if you are to cut out a Thorn, or the Point of any Weapon, or if you are to open a *Fistula* or an Abscess, you can perform nothing aright without Anatomy.

It is through want of Skill in this, that sometimes Sense, sometimes Motion, sometimes both are violated, or wholly abolished, and (which is worst of all) a contemptuous neglect hereof by some Physicians has been the cause of present death to some Persons.

Of such moment is the knowledge of Anatomy, both in cure of Diseases, and in presaging the Event. But unskilfulness makes Men bold where there is reason to fear, and timorous where all is safe, and no occasion of fear is.

Yet now adays how many Medical Rabbies are there pretending themselves to be either Chymists or Galenists, and not inferior to the Master of their Sect, who do not understand Books of Anatomy: So far are they from ever having seen or shown to others any Dissections. And divest but these fellows of their Titles, you'll find them mere Syrrup-mongers, endeavouring more to please the Palate than to cure Diseases.

Which indeed is the reason we have so many circumforaneous Impostors, who promise boldly every thing to the unlearned Multitude, relying upon Receits for Medicines composed without Reason.

Hence it is come to pass, that he who knows but how to make up a Medicine, dares pronounce his Judgment of Diseases, and give his Medicines without any regard had to an able and learned Physician. And so Fellows play with Mens lives, who have skill in nothing, much less in so abstruse an Art as Physick is.

Wisely therefore have our Laws provided, that none but such as are recommended by their Learning and Probity, should be admitted to take care of the Health of Men, none I say, but such as are approved of by the Learned. We have not in *England* wanted our *Cato*'s, *Boethus*'s and *Paulus*'s, who by Law have kept Sycophants and Knaves from Practising of Physick; who have obliged every one to Practise that Art and Trade he has been brought up to, and who have restored Learning to its place and honor.

For only the Learned in Anatomy know, what Part a Disease does primarily affect, and what by Sympathy, of what Nature things are, and what Remedies ought to be applied to each Part, since the Method of Cure varies according to the Nature of several Parts.

Only Men skill'd in Anatomy can give true Judgment upon a Wound, whether it be Mortal or no, which is of no small moment to a Judge or Magistrate for their Conduct and Procedure upon Criminals in that particular.

Such likewise they must be, who by dissecting a Diseased Body, can procure any advantage to the living, by finding out more proper Remedies, according as by Dissection they have found in others the cause and seat of the Disease.

Though by what has already been said, you see the Credit and Reputation Anatomy has in former Ages been, yet the Study of it never flourished more than in this last Age, wherein so many are so strenuously industrious, that one would think in our Age it might be brought to perfection. Who can ever forget the Learned *Asellius*, for finding out the Lacteal Veins? No less than immortal Glory can be due to the Renown'd *Harvey*, our Country-man, for finding out the Circulation of the Blood. He that cannot acknowledge the Excellency of our *Willis* for his Anatomy of the Brain, must never pretend to the subject Discourse. The curious Researches of our *Wharton* on the Glands surpass what has been said in former Times. The Scholastic and Learned *Glisson* has performed his Share in trasing the Meanders of the

Liver-

Liver-Veſſels. The acute *Lower* has ſhown in ſenſible Terms, how the prime Mover of the Humane Machine exerts its Power. The renowned *Bartholinus* in *Denmark*, the *Swammerdam's*, *Bilſius's*, *de Graaf's*, and others in the Low-Countries; but eſpecially the Learned and Laborious *Diemerbroeck*, in *Utrecht*, have raiſed to themſelves immortal Monuments of their Learning and Induſtry about this Subject. And upon *Diemerbroecks* Labours principally, what I have here to ſay, ſhall be employed. He ſays, he had for ſeveral Years been converſant in Anatomical Studies; that in teaching others, he had learned many things himſelf that were new, and till his Time altogether unknown; upon which he reſolved to write a Book of particular Obſervations, and make them publick, as he ſaw ſeveral others had done before him. But abundance of his Friends diſſwaded him from this, and urged him rather to write a whole Body of Anatomy, and to put into it (beſides what *Galen*, *Euſtachius*, *Veſalius*, and others had written, who had been moſt excellent in Works of this Nature) not only his own, but all the Modern Inventions of all Learned Men whatſoever. This Advice was not unwelcome to him, becauſe none had attempted this before him. But the Attendance upon his Practice, the Greatneſs of the Undertaking, and the Criticalneſs and Cenſoriouſneſs of this curious Age, to ſay nothing of the Malice and Envy of ſome, did a little deterr him. However, theſe Difficulties being ſurmounted, he undertook the Buſineſs, finiſhed it, and made it publick.

All the new things, which either he could find out, or were hitherto found out by the beſt of Anatomiſts, he has here brought upon the Stage. He further, in his Firſt Edition, engaged, that whatever hereafter he ſhould find lying hid in obſcurity, he would bring to light, and when he died, that he would bequeath all to Poſterity. For as long as the Deſire of advancing Anatomical Knowledge ſhould continue in the World; he knew innumerable other things would be produced, which we cannot now ſo much as dream of, ſuch

things

things he recommends to Posterity, and that out of Love to the common Welfare, Men would not hereafter scruple to undertake this Province.

In this Anatomy of his, he tells you, he is not so ambitious as to arrogate to himself the excellent Sayings, or the new Inventions of others; but desiring to give every one his due Honour; he sets down the Names of the Authors, of whom he borrowed any thing; for, as *Pliny* says, *He ever reckoned it a piece of Good Nature and Modesty, to acknowledge his Benefactors, but that it was an Argument of Guilt and Ill Nature, to chuse rather to be catched in Theft, than to restore another his own, when he at the same time is in debt upon Interest.* And so he gives to all their Due. For, he professes, he would not be accounted one of these, that by writing of Books, would procure themselves a Name, who by raking and scraping all they can from others, get a great deal together, and vaunt it all for their own, concealing the Authors Names from whence they stole, when in the mean time they mis-apprehend perhaps the Authors Meaning, and what they have thence transcribed, neither they themselves well understand, nor are they able to express it to others.

Nevertheless, in quoting of Authors, he uses not many Flatteries and Complements, but avoids all fulsome and Adulatory Blandishments, wherewith abundance of Books now adays are rather blotted than adorned, while they style the Authors, whom they cite, the most Eminent, never enough to be commended, the most Acute, the most Famous, the most Learned, the most Noble, the most Celebrated, &c, and adorn themselves, especially such as are yet alive, with I know not what Epithetes (it may be to avoid and prevent some shrowd Objections, which haply they might otherwise fear; or that they themselves being ambitious and delighted with such empty Applause, desire the same Favour, at one time or other, to be returned upon themselves) he reckons, all he quotes, to be Learned Men, nor does he doubt of it, though he thinks some more Learned than others.

thers. Therefore he would have no Man take it ill, that he lards not his Name with many ſuch Epithets; becauſe, as Complements now paſs indifferently upon all Men, they rather ſully the Illuſtrious Worth of the Deſerving, than add any Splendor to it.

In this Book he ſtudies not ſo much Politeneſs of Style, as the Truth, which has no occaſion for Bombaſt and Rhetoric. But that he may the better diſcover what the Truth is, in ſeveral places he oppoſes other Mens Opinions, but in a friendly way; ſome he refutes, and wholly rejects, but without any Malice; here and there he uſhers in his own, but without Ambition; and whereas he has obſerved, that in moſt Authors, ſeveral things are wanting about the True Uſe of the Parts, many things, either written or judged amiſs, in ſeveral places he treats more fully concerning it, but without Diſparagement or Reproach to others. For he never reckoned it any Fault in a Learned Man, that all other Mens Writings do not pleaſe him alike, nor that he corrects many things, and contradicts many, provided it be done civilly, and without Virulence and Calumny; which alaſs! is now the Practice of too many Supercilious Scriblers, who, the better to defend their Darling Opinions, and theſe often taken, and ſtolen from others, and vouched for their own, had rather attack their Adverſaries with foul Words and Scurrilous Writings (which does not at all become Learned Men) then concert the difference in friendly Reaſonings.

In the Seventh Book of this Work, and other where, in deſcribing the Ducts of the Veins, he takes a new and unuſual Method; for whereas other Anatomiſts heretofore derived the Branchings of the Veins from the *Vena Cava* and other great Veins, to all the Parts of the Body, he on the contrary proſecutes them from the Parts to the great Veins, and ſo to the *Vena Cava*, that ſo the continual Progreſs of the Blood, according to the Order of Circulation, might the better be demonſtrated.

Thus much he publiſhed in his Life Time: But before

he

he died, he had made ſeveral freſh Collections, and ſomewhere Alterations. Theſe in this laſt Edition, from whence this Tranſlation was made, are added by his Learned Son. Wherein we may modeſtly aver, that the moſt material things, found either in Ancient or Modern Anatomiſts, are comprehended, and far more Opinions and Diſcoveries, than ever were contained in any one Anatomical Treatiſe yet extant.

Now it being agreed by all skilful Phyſicians, that Anatomy is the ſolid *Baſis* of Phyſic; and (as has before been ſaid) the Learned *Diemerbroeck* having excelled in laying the Corner Stone, how can it reaſonably be ſuggeſted, that the ſame Learned Hand cannot build a Superſtructure Correſpondent? The Author therefore having not reſted in Theory alone, but having put in Practice what he ſo well knew in the Art of ſaving Men; and moreover, having given, not only his own, but other Mens Practice in the moſt Epidemic Diſeaſes, the Small-Pox and Meaſles, which were never till this Edition made publick; we thonght we could not do better, than give our Country-men, in their own Tongue, what he ſo advantagiouſly has written in the Learned, and only to ſuch as underſtand that. In theſe acute and violent Diſeaſes, we find the beſt Methods yet invented, ſcarce ſufficient to reſcue the major Part of Patients from them; how requiſite therefore is it, that the Skill of ſo Learned and ſucceſsful a Phyſician as Ours ſhould not dye with him? But he reſts not here, his worthy Son has likewiſe communicated in this Edition, ſome of his Fathers Obſervations upon various Diſeaſes, wherein conſiſts the Life and Soul of Phyſic; for in them, as in a Piece of Workmanſhip, you may ſee the Authors Skill, better than in any Precepts, inaſmuch as it is much eaſier to preſcribe Rules how to act, than to put thoſe ſame Rules in Practice. So that in this Volume you may have a Summary of the Excellencies in the Art of Phyſick, which ſo many Learned Men in all Ages, ſince Phyſic was an Art, have by their utmoſt Diligence and Ingenuity been able to accompliſh.

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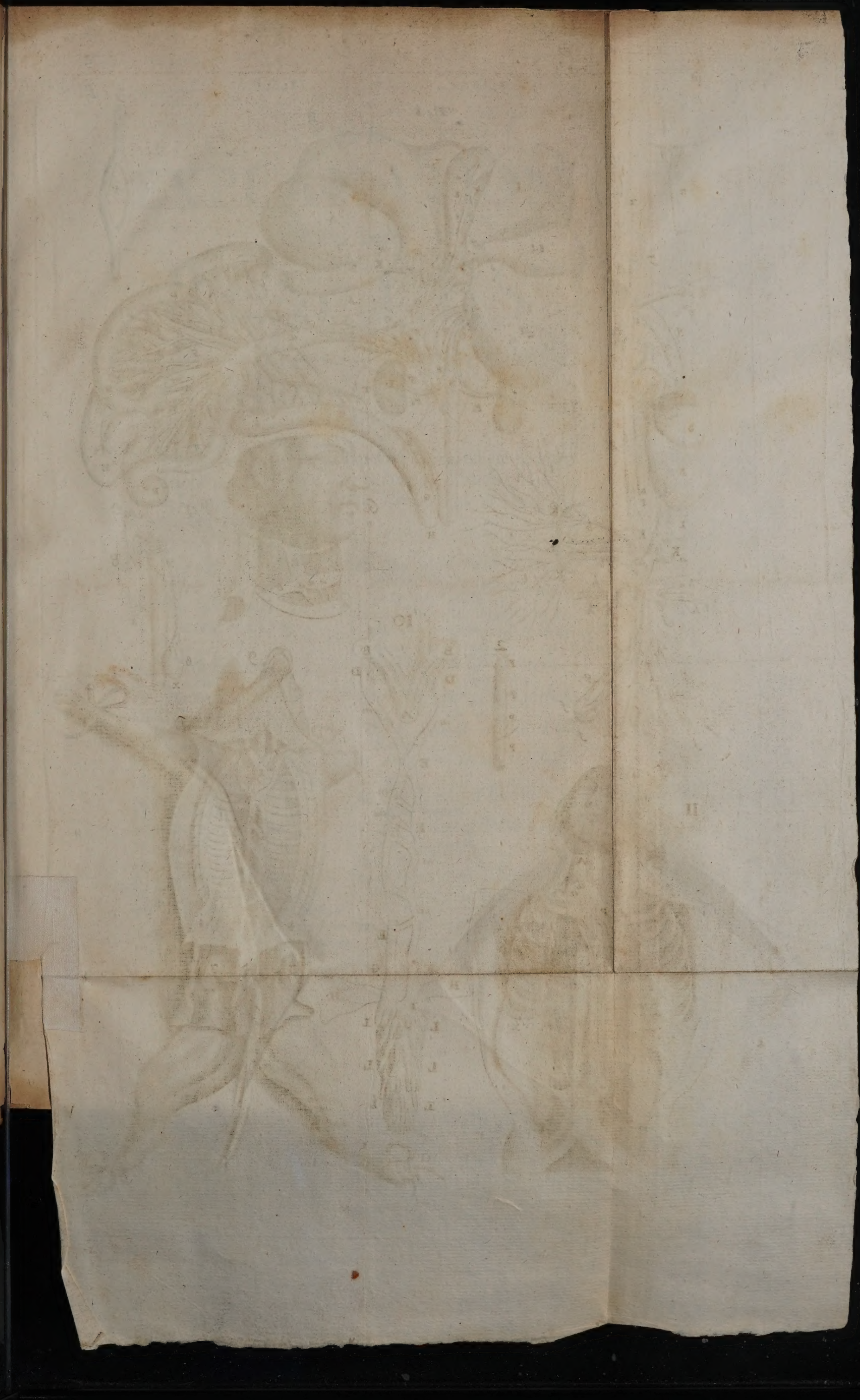

Fig. I.

THE EXPLANATION Of the Sixteen PLATES.

The EXPLANATION of the *First* TABLE. In *Folio* 68.

This Table exhibits the Delineations of the Chyle-bearing Channels, the Pectoral Chyle-bearing Channel, and of the Lymphatic Veſſels of the Liver; cut in Braſs by their firſt Diſcoverers.

FIGURE I.

All the ſaid Veſſels, as they occur in a Dog.

A. THE *Ventricle.*
B. *The Pylocus.*
CC. *The Duodene Gut.*
DDD. *The Jejune Gut.*
EEE. *The Ilion Gut.*
F. *The Blind Gut.*
H. *The Beginning of the Right Gut.*
IIIII. *The five Lobes of the Liver.*
K. *The Veſicle of the Gall.*
LL. *The Kidneys.*
MM. *The Emulgent Veins.*
NN. *The Hollow Vein.*
O. *The Gate Vein.*
R. *The Veſicle of the Chylus.*
SS. *The Meſentery.*
TT. *The broken Part of the Meſentery, that the Ligature of the Lymphatic Veſſels of the Liver might be conveniently adapted.*
aa. *The Glandulous Sweet-bread.*
bb. *The Fleſhy Sweet-bread, annexed to the Duodenum, and lying under the Ventricle.*
ccccc. *The milkie Veins lying between the Inteſtines and the Glandulous Sweet-bread.*
ddd. *The Milkie Veins iſſuing out of the Glandulous Sweet-bread.*
eeeee. *The Exits of the Lymphatic Veſſels from the Liver.*
fff. *The Progreſs of them to the Kernel.*
m. *And from thence into the Chylus-Bag.*
gg. *Two Branches of the Choller-receiving Channel.*
H. *The Inſertion of this Channel into the Duodenum.*
iiiii. *The Meſaraic Veins.*
m. *A Kernel ſeated under the Porta Vein, receiving the Lymphatic Veſſels of the Liver.*
nn. *One of theſe Channels creeping through the Veſicle of the Gall.*
oooo. *The Ramification of the Porta Vein, and its Ingreſs into the Liver.*

tt. *The Veins of the Veſicle of the Gall.*
xxxx. *The Places of the Valves in thoſe Channels.*

FIGURE II.

pppp. *The Places of the ſame Valves.*

FIGURE III.

T. *The Bifurcation of the Chyle-bearing Channel in the* Thorax, *under the Heart, as it is frequently found.*

FIGURE IV.

z. *The various Ramification of the Chyle-bearing Channel leſs common.*

FIGURE V.

x. *The Axillary Vein, with the Left Jugular i.*
n. *The threefold Inſertion of the Chyle-bearing Channel, leſs common; for it is more frequently ſingle.*

FIGURE VI.

AAA. *The ſame Inſertion in a Mans Head.*
BB. *The Axillary Vein entire.*
C. *The External Jugular Vein.*
d. *The Clavicle.*

FIGURE VII.

A. *The Heart removed to the Side.*
BB. *The Lungs turned back.*
CC. *The Hollow Vein.*
D. *The Right Axillary Vein.*
E. *The Left Axillary Vein.*
F. *A part of the ſame Vein opened to ſhew the Inſertion of the Chyle-bearing Channel.*
G. *The Sternon delineated only with Points.*
H. *The Left Jugular Vein.*
II. *The Aorta Arteria.*
KK. *The little Chylus-bag.*
L. *The Hepatic Branches of the Hollow Vein.*
aa. *The Emulgent Veins.*
bb. *The Lumbar Veins.*
dd. *The Crural Veins.*
eeee. *The Lymphatic Veſſels under the Right Gut, tending upwards to the Chylus-bag,*
fffff. *The Kernels placed by the Crural Veins, out of which thoſe Lymphatic Veſſels riſe.*
ggg. *The ſaid Lymphatic Veſſels riſing out of the Kernels.*
hhh. *The Lymphatic Veſſels proceeding between the Muſcles of the Abdomen to the Chylus-bag.*
iiii. *The Milkie Veins creeping between the Glandulous Sweet-bread and the Chylus-bag.*
kkk. *The Glandulous Sweet-bread.*
ll. *The Milkie Meſenteric Veins between the Glandulous Sweet-bread, and the Chylus-bag.*
MM. *The Chyle-bearing Channel in the Thorax.*
N. *The Inſertion of it into the Axillary Vein.*
oo. *The Kernels of the Sternon.*
pp. *Their Lymphatic Veſſel diſcharging it ſelf into the Channel of the Chylus in the Thorax.*
Q. *A little Branch of it proceeding toward the Ribs.*
RR. *The Glandules of the Heart.*
S. *Their Lymphatic Veſſels inſerted into the Chyle-bearing Channel under the Heart.*

FIGURE VIII.

xx. *The Gullet.*
ϱ. *The Kernel annexed to it.*
γγ. *The Lymphatic Veſſel ariſing out of it, and inſerted into the Chyle-bearing Channel.*
ſſ. *The Chyle-bearing Channel.*

FIGURE

FIGURE IX.

The Chyle-bearing Channel in a Dog, as first discovered by *Pecquetus*, and by him delineated.

1. *The Trunk of the Hollow Vein ascending.*
2. *The Receptacle of the Chylus.*
3. *The Kidneys.*
4.4. *The Diaphragma dissected.*
5.5. *The Lumbar Psoa Muscles.*
66. *The several Meetings of the Chyle-bearing Channels.*

FIGURE X.

The same Chyle-bearing Channel, together with the Chyle-Bag, taken out of a Dog.

A. *The Trunk of the Hollow Vein ascending, open'd upwards in length.*
BB. *The Meeting of the Jugular and Axillary Veins; where the Springs of the Chylus are marked out by Points.*
CC. *The Valves of the Jugular Veins looking downwards.*
DD. *The Distribution of the Milkie Vessels to the Springs, as described by* Pacquetus.
EEE. *Various Meetings of the Milkie Vessels.*
F. *The Ampulla, or upper Part of the Chyle-bearing Bag, conspicuous in the Thorax, near the untouched Diaphragma, toward the Left Side.*
G. *A little Channel appearing on the Right-hand by the Diaphragma.*
HH. *The remaining Portion of the Diaphragma.*
I. *The Receptacle of the Chylus.*
LLL. *The Milkie Mesaraics entring the Chyle-bag, cut off.*
MMM. *Several Valves of the Chyle-bearing Channel.*
ooo. *Valves preventing the Return of the Ascending Chylus.*

FIGURE XI.

The Chyle-bearing Channel in a Man, as discovered and described by *Bartholinus*.

A. *The Upper Chyle-bag rare and seldom seen.*
bb. *Two Chyle bags mutually joyned to the Milkie Vessels, seldom seen, for generally there is but one.*
ccc. *The Milkie Branches ascending from the Bags.*
D. *The single Thoracic Branch.*
E. *The Right Emulgent Artery.*
FF. *The Kidneys.*
GG. *The descending Trunk of the Great Artery, cut off below the Heart.*
H. *The Spine of the Back.*
K. *The Gullet turned back to the side.*
LL. *The Kernels of the Thymas.*
M. *The Thoracic Channel tending to the Subclavial Rib.*
N. *The Insertion of the Chyle-bearing Channel into the Subclavium.*
o. *The Valves.*
P. *The inner Form of the Axillary Vein, expanded and slit the full length.*
R. *The External Form of the Jugular Vein.*
TTT. *The Ribs of each Side.*
V. *The Bladders in their proper Holes.*
xx. *The Diaphragma laid open on each side.*

The EXPLANATION of the *Second* TABLE. In *Fol.* 69.

This Table shews the Lymphatic Vessels seated in the Neck, as they are describ'd one way by *Lewis de Bills*, and another way by *Jacob Henry Pauli*.

FIGURE I.

The Lymphatic Channels of the Neck described by *Lewis de Bills*, and by him call'd the Dew-bearing Channels.

A. THE *Dew-bearing Channel ascending upwards from the Cistern.*
B. *The fissure of the said Channel about the fifth and sixth Vertebre of the* Thorax.
E. *The Winding Receptacle which that Channel makes above the small Twigs of the Jugular Vein.*
F. *The windings which that Receptacle makes about the writh'd Receptacle.*
3. *Part of the Hollow Vein under that Receptacle.*
4. *The Kernels of the* Thorax.
G. *A Branch of the Dew-bearing Channel, running forth to the Kernels of the Breast.*
H. *The Branch that grows to the Thoratic Kernels under the winding of that Channel.*
I. *A Branch of the Dew-bearing Channel, ascending to the upper Kernel of the Neck.*
K. *A little Twig of the first Branch ascending upwards.*
L. *A Branch of the same ascending to the lower Kernel of the Neck.*
M. *The division of the Branch* L.
5. *The lowermost Kernel of the Neck.*
N. *The Gullet.*
O. *The Jugular Vein.*
P. *A little Sprig of the Jugular Vein.*
R. *A Trunk of the great Artery.*
V. *The Guts distorted.*
X. *The Dew-bearing, by us called Milkie Veins.*
YYY. *The great Kernel of the Mesentery, or* Asselius's *Sweetbread, with the Kernels adjoyning to it.*
Z. *The little Pipes from the Mesenteric Glandules toward the Cistern.*
6. *The* Duodene *Gut cut off.*
7. *The Right Gut cut off.*
9. *The hollow part of the Liver with its Lobes.*

FIGURE. II.

The Lymphatic Channels of the Neck, described by *Jacob Henry Pauli*.

AA. *The* Hyoides *Muscles in the* Sternon *out of place.*
B. *The Sheild resembling Gristle.*
C. *The Pipe of the* Aspera Arteria.
DD. *The Gullet lying under the* Aspera Arteria.
EE. *The Muscles of the Neck cut athawrt.*
G. *The hollow Vein ascending.*
HHH. *The Axillary Veins.*
II. *The External Jugulars out of place.*
KK. *A Sprig of the External Jugular near the Neck.*
LL. *The External Jugulars.*
M. *The single Channel of the Jugular Lymphatics, coming from the long Kernel, and partly spread upon the Gullet, out of place.*
NN. OO. *Two Lymphatic Vessels proceeding from the Cervical Kernels.*

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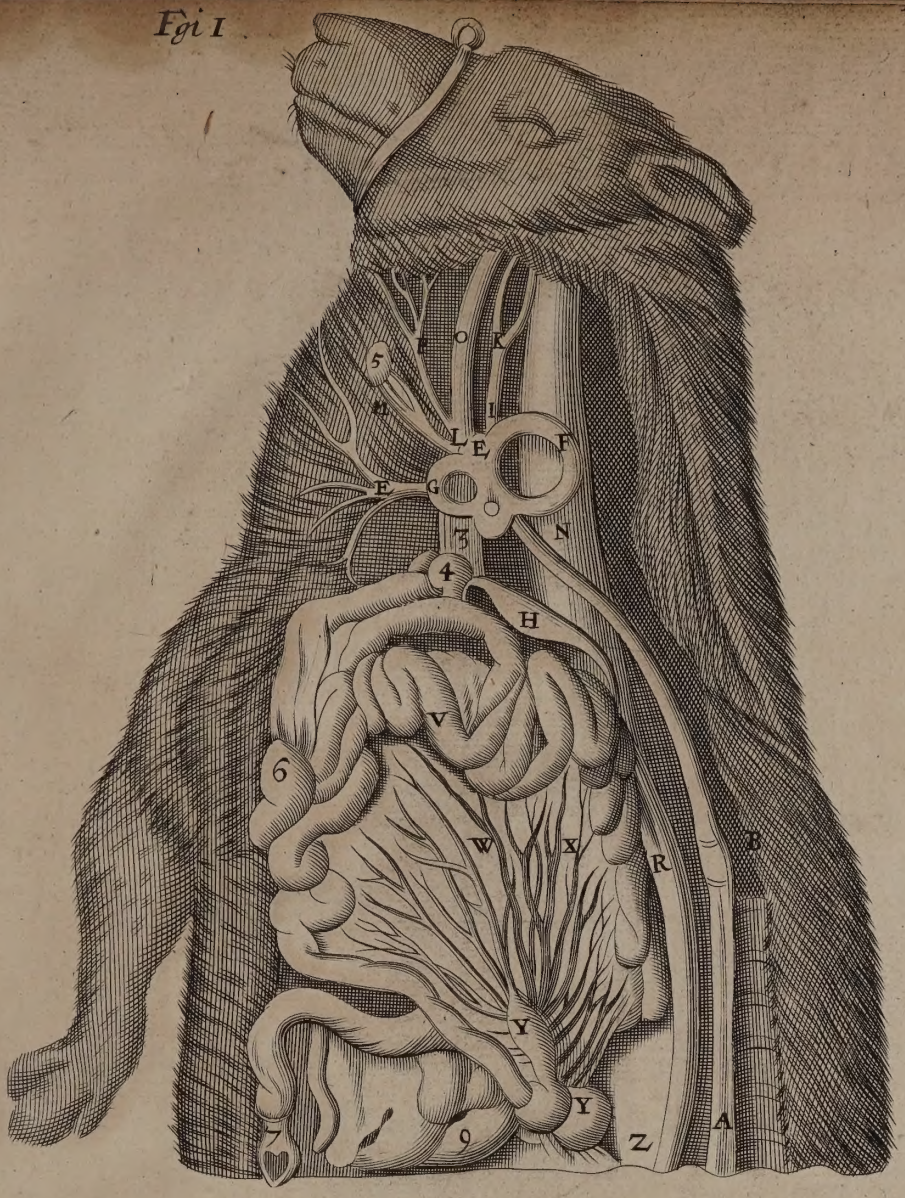
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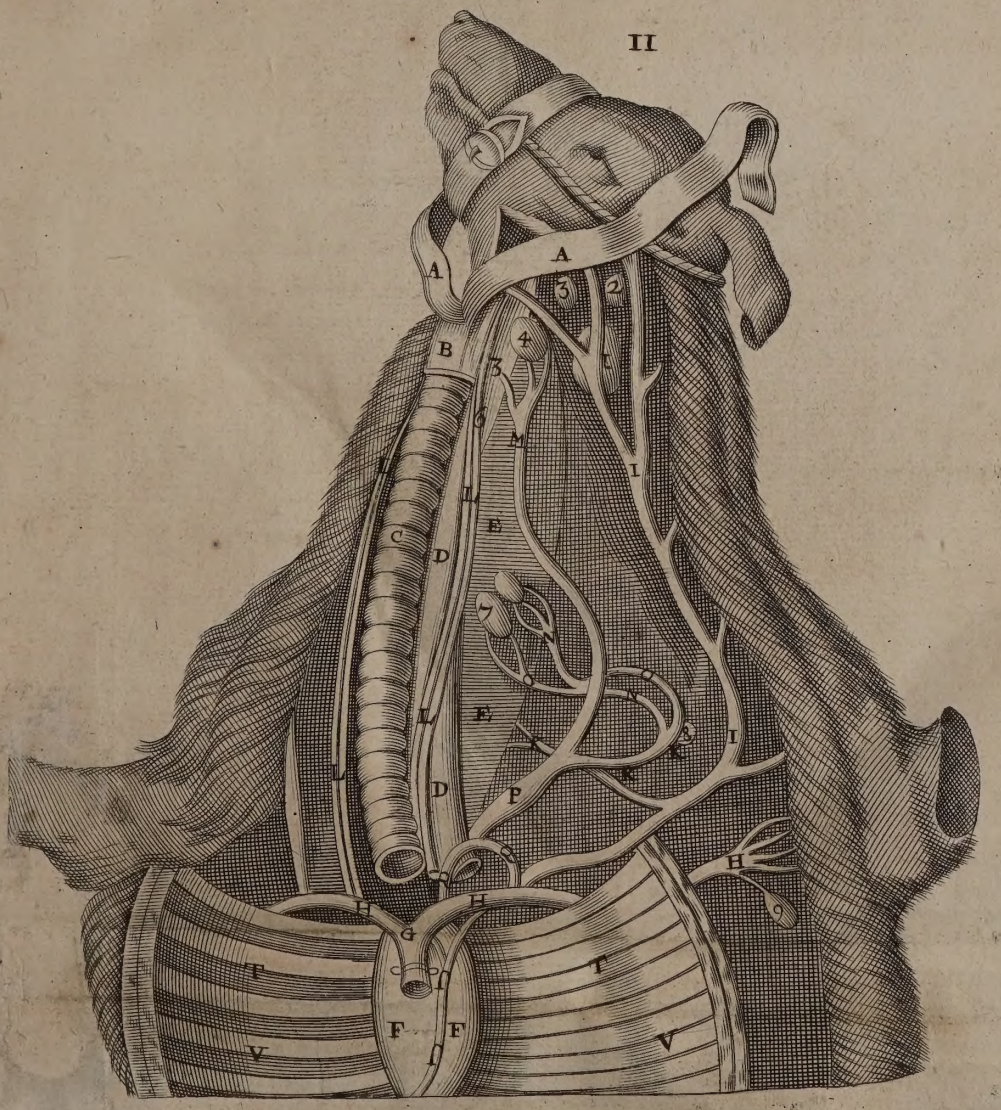
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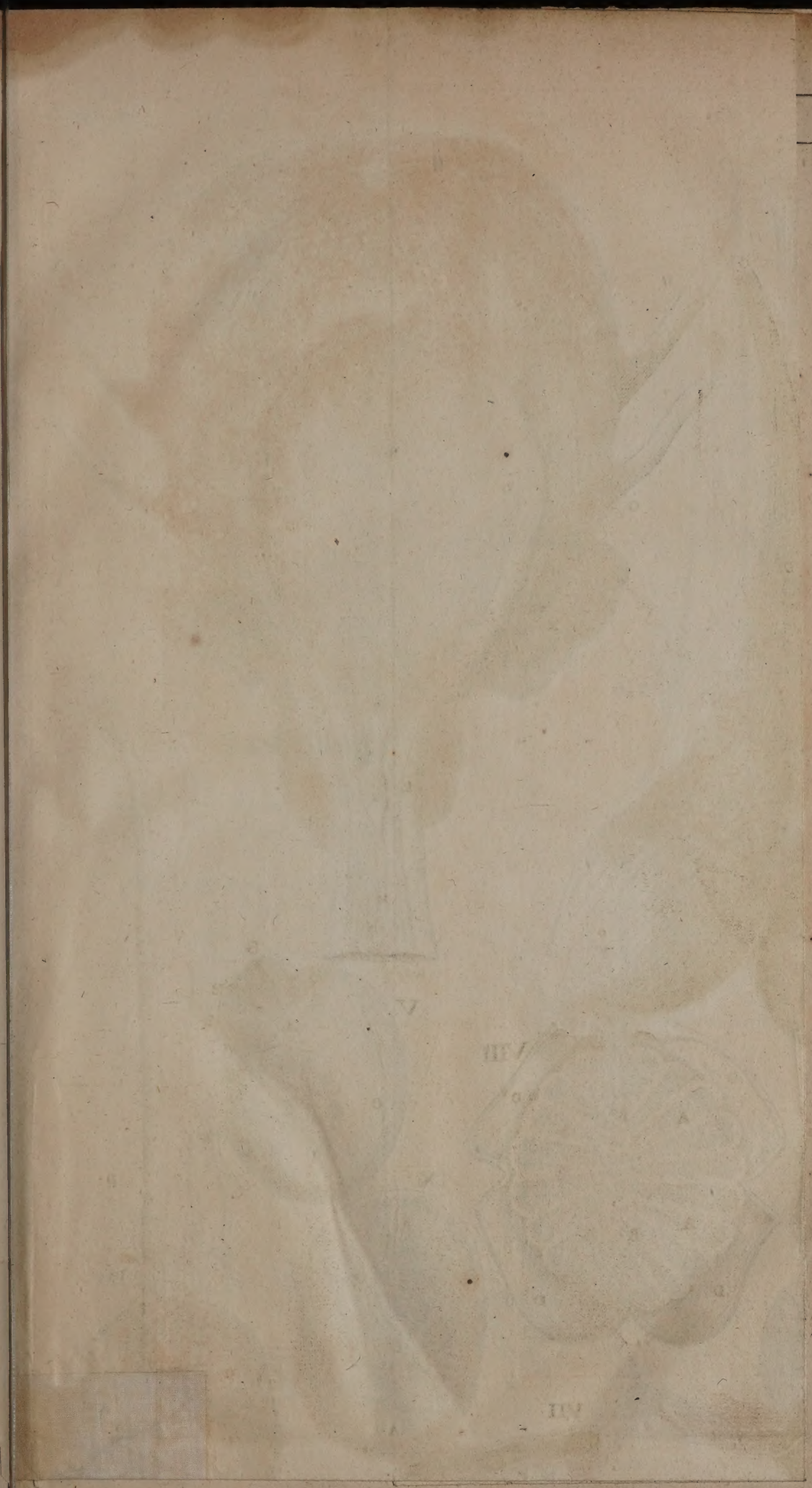

Tab. III.

P. *The common hole like a Viol.*
qq. *Two Appendixes, one entring the Axillary, the other the Jugular Veins.*
ſſ. Pecquetus's and Hornius's *Thoracic Channel, aſcending from the Chyle-bag.*
TT. *The upper Ribs.*
V V. *The lower Ribs.*
1. *The lower conglobated* Parotic.
2. *A ſmall Kernel ſeated outwardly above the Jaws.*
3. *The Maxillary Kernels, round.*
4 *The oblong Maxillary Kernel.*
5 *The leſſer Kernel ſometimes wanting.*
6. *The fleſhy* Tyroidæan *Kernels diſcovered by* Wharton.
7. *The Cervical Kernels compacted like a Bunch of Grapes.*
8. *The Kernels of the Neck, ſometimes placed outwardly next the External Jugular, but ſeldom.*
9. *The under Axillary Kernel.*

The EXPLANATION of the *Third* TABLE. in *Fol.* 146.

This Table ſhews the Urinary Bladder, and the Teſticles in Men, with their dependencies acurately deſcrib'd by *Regner de Graef.*

FIGURE. I.

The Urinary Bladder with the Parts annexed.

A. *That part of the Urinary Bladder to which the Urachus was annexed.*
B. *The fore-part of the Urinary Bladder open'd.*
CC. *The Ureters.*
DD. *The Exit of the Ureters into the Bladder.*
E. *The Neck of the Bladder.*
FF. *The Parts of the ſeminary Veſſels cut off.*
GG. *The Veſſels running forth to the ſeminary Veſſels.*
HH. *The Seminary Bladders blown up.*
I. *The Caruncles with two holes through which the Seed breaks forth into the Ureter*
KK. *The Glandulous Body, or the Proſtate open'd in the fore-part.*
LL. *The ſmall mouths of the Channels of the Glandulous Body, opening into the ſides of the Caruncle, and unleſs they be blown up, conſpicuous only by certain points.*
M. *The Beak of the Caruncle.*
N. *The Ureter open'd in the upper part.*

FIGURE II.

The Teſticles of a Man with its Coverings.

A. *The Parts of the preparing Veſſels cut off.*
B. *The Vaginal Tunicle containing all the Veſſels of the Tunicle.*
C. *The beginning of the Cremaſter Muſcle.*
D. *The Fleſhy Fibres of the ſame, annex'd to the Vaginal Tunicle, and running out the whole length of it.*
EE. *The Fleſhy Fibres of the ſame, ending obſcurely in the Vaginal Tunicle.*
F. *The Vaginal Tunicle containing the Teſticle.*

FIG.

FIGURE. III.

The Testicle with its Coverings annex'd laid bare.

A. *The Preparing Vessels cut and turn'd back.*
B. *The same Vessels annex'd one to another by slender Membranes.*
CC. *The Artery preparing the Seed, carry through the Belly to the Stones.*
DD. *The Ramifications of the Veins preparing the Seed through the sides of the Stone.*
E. *The Albugenious Tunicle containing the substance of the Testicle.*
F. *The Vaginal Tunicle thrown back.*
G. *The bigger Globe of the* Epididymis.
H. *The middle part of the* Epididymis.
I. *The lesser Globe of the same.*
K. *The end of the same, or the beginning of the Vessel carrying the Seed.*
L. *The different Vessel cut away.*

FIGURE IV.

The Testicle inverted.

A. *The Artery preparing the Seed.*
B. *The division of it into two Branches.*
CC. *The bigger Branch carry'd to the Testicle.*
DD. *The lesser Branch hastening to the* Epididymis.
E. *The bigger Globe of the* Epididymis *adhering to the Testicle.*
FF. *The* Epididymis *inverted, to shew how the Artery runs under it.*
G. *The end of the* Epididymis.
H. *The Vessel carrying the Seed cut away.*

FIGURE V.

A. *The beginning of the* Epididymis, *where the Seminary Vessels perforate the Albugineous Tunicle.*
BBB. *The bigger Globe of the* Epididymis *drawn upward, to shew the Ramifications of the Vessels, and their entrance into the Testicle.*
C. *The preparing Vessels cut off.*
D. *The Divarications of the preparing Vessels through the Albugineous Tunicle.*
E. *The Albugineous Tunicle.*

FIGURE VI.

A. *The Body of the Testicle, the Albugineous Tunicle being taken off.*
BB. *The Albugineous Tunicle inverted.*
CCC. *The Portions of the preparing Vessels preforating this Tunicle cut away.*
D. *The Albugineous Tunicle sticking close, to the back of the Testicle, by reason of the Membranes of the Testicle there meeting.*

FIGURE VII.

A. *The substance of the Testicle, separated from the Albugineous Tunicle.*
BBB. *The Solutions of the substance; by which it appears not to be a Glandulous body, as at first sight it seems to be, but a Body compos'd of Vessels.*
C. *The Albugineous Tunicle stretch'd upward.*

FIGURE VIII.

AAA. *The Seminary Vessels of the Testicles placed in a certain order between the thin Membranes.*
BB. *The Seminary Vessels running out through the Membranous substance sticking to the back of the Testicle.*
C. *Certain small Portions of the Seminary Vessels perforating the Albugineous Tunicle, cut off.*
DDDD. *The Albugineous Tunicle opened, and drawn to the sides.*

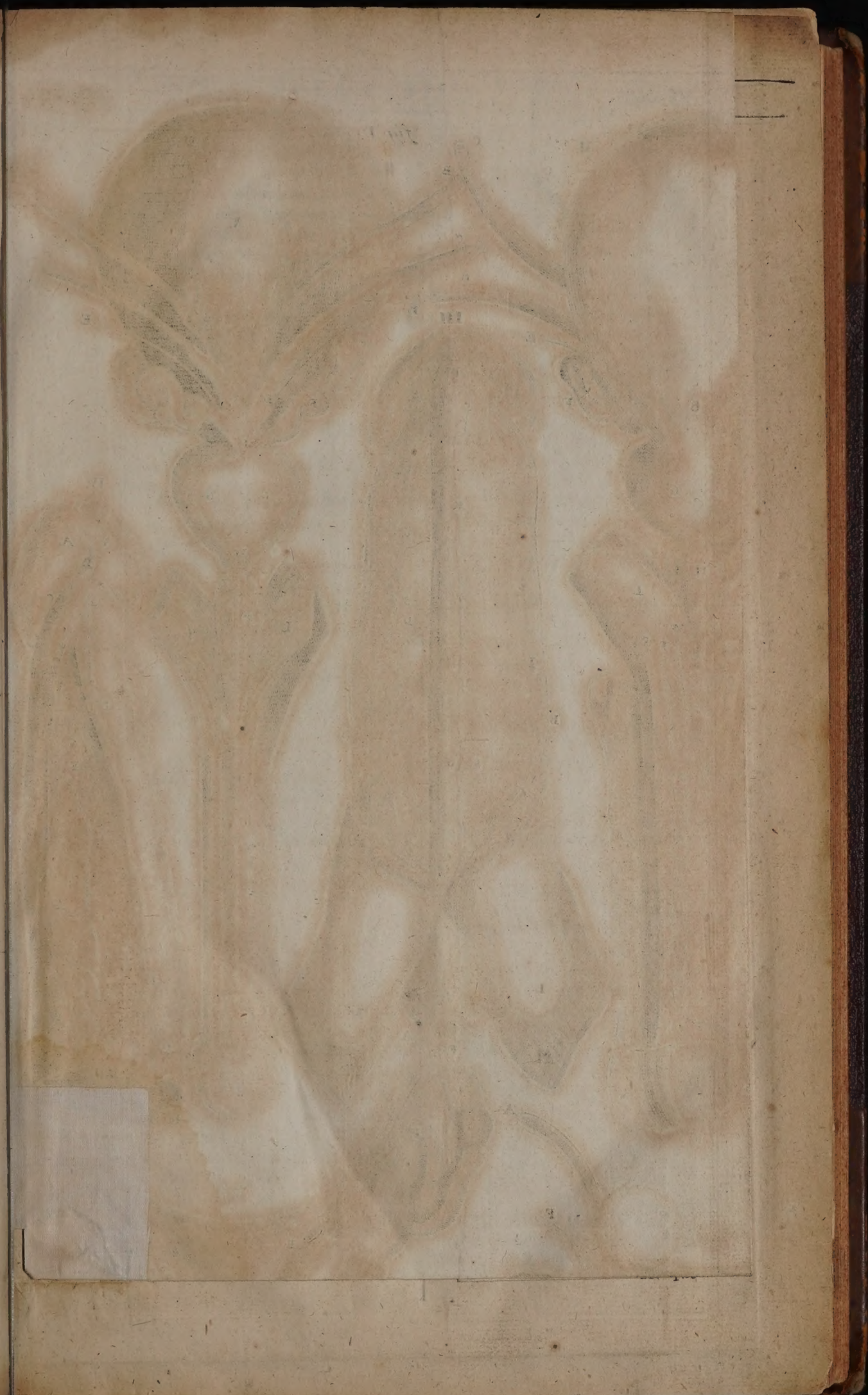

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FIGURE IX.

A. *The Teſticle cut athwart.*
BBB. *The Diſpoſition of the Seminary Veſſels.*
C. *The Concourſe of the Membranes detaining the Seminary Veſſels, leaſt they ſhould be jumbled together, ſticking cloſe to the Back of the Teſticle.*

FIGURE X.

The Proſtate or Glandulous Body.

AA. *The Glandulous Body opened in the Fore-part.*
B. *The Ureter opened in the upper Part.*
C. *The Paſſages of the Glandulous Body laid bare.*
O. *The Place of the Caruncle, through which the Seed breaks forth into the Ureter.*

FIGURE XI.

The Veſſel of the Teſticle of a Dormouſe.

A. *The Spermatic Artery deſcending to the Teſticle.*
BB. *The whole Teſticle, with admirable Dexterity, cleared ſo as to ſhew the Veſſels.*

The EXPLANATION of the *Fourth* TABLE In *Fol.* 154.

This Table ſhews the Yard, with the Seminary Veſſels, and other Parts annexed to it, exactly delineated by *Regner de Graef.*

FIGURE I.

The hinder Part of the Yard.

A. *The Urinary Veſſel.*
BB. *Portions of the Ureters.*
CC. *Portions of the Veſſels carrying the Seed.*
DD. *The deferent Veſſels dilated like little Boxes.*
EE. *The Veſſels running forth to the Seminary Veſſels.*
FFFF. *The Seminary Veſſels diſtended with Wind.*
GG. *The Hinder Proſpect of the Proſtatæ.*
H. *The Ureter.*
I. *The Meeting of the deferent Veſſels, with the Seminary Veſſels.*
K. *The Muſcle dilating the Ureter.*
L. *The ſame Muſcle drawn back to the Side.*
M. *The Spungy Part of the Yard under the Ureter.*
NN. *The Ureter.*
OO. *The Spungy Bodies of the Yard.*
P. *The Nut.*
qq. *The Muſcles extending the Yard.*

FIGURE II.

The Forepart of the Genital Parts.

A. *The Urinary Bladder.*
B. *The Neck of the Bladder.*
CC. *Portions of the Ureters.*
DD. *Portions of the Veſſels carrying the Seed.*
EE. *Veſſels running forth to the Seminary Veſſels.*
FF. *The Seminary Veſſels.*
GG. *The Proſtatæ.*

H. *The Ureter adjoyning to its Spongy Part.*
Il. *The Spungy Part of the Ureter.*
KK. *The Muſcles erecting the Yard.*
LL. *The Beginning of the Nervous Bodies ſeparated from the Share-Bones.*
MM. *The Skin of the Yard drawn to the Sides.*
NN. *The Doubling of the Skin which conſtitutes the Preputium.*
OO. *The Skin which was annexed behind the Nut.*
P. *The Back of the Yard.*
Q. *The Nut of the Yard.*
R. *The Urinary Paſſage.*
SS. *The Nerve running forth above the Back of the Yard.*
V. *The Nervous Bodies meeting together.*
WW. *Two Veins meeting together, and running along the Back of the Yard with one remarkable Branch.*
X. *The Vein opened to ſhew the Valves.*

FIGURE III.

The Yard divided to the Ureter.

AA. *The Nut of the Yard, together with the Nervous Bodies divided through the Middle.*
BB. *The Membranes of the Nervous Body of the Yard divided one from the other.*
CC. *An Artery creeping through the Spungy Subſtance of the Nervous Body.*
DD. *The Spungy Subſtance of the Yard.*
EE. *The intervening Fence.*
FF. *The Fibrous Shoots of the Intervening Fences, aſcending like a Comb.*
G. *The Ureter cut off about the Glandulous Body.*
H. *The Middle of the Ureter.*
I. *The End of the Ureter perforating the Nut.*
KK. *The Spungy Subſtance of the Ureter.*
LL. *The Beginnings of the Nervous Bodies dilated like little Bellows.*
MM. *The Muſcles erecting the Yard.*

FIGURE IV.

The Yard opened at the Side.

AA. *The Nut laid bare.*
B. *The Bridle.*
CC. *A Portion of the Skin, from which the other Part covering the Yard, is ſeparated.*
DD. *The Ureter lying under the Nervous Bodies.*
EE. *The Membranes of the Nervous Bodies of the Yard divided.*
FF. *An Artery ſhooting out through the Spungy Subſtance of the Nervous Body.*
GG. *The Spungy Subſtance of the Nervous Body.*
HH. *The Orifices of the Arteries cut off.*
I. *The Ureter.*
K. *The Spungy Subſtance of the Ureter.*
LL. *The intervening Fence of the Nervous Bodies.*

FIGURE V.

The Yard diſſected athwart.

AA. *The Spungy Subſtance of the Nervous Bodies.*
BB. *Two Arteries perambulating the Nervous Bodies.*
C. *The Urinary Paſſage of the Ureter.*
D. *The Spungy Subſtance of the Ureter.*
E. *The Intervening Fence.*
FF. *The ſtrongeſt Membrane of the Nervous Bodies.*
G. *The thinneſt Membrane containing the Spungy Subſtance of the Ureter.*
A. *A remarkable Vein creeping along the Back of the Ureter.*

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FIGURE VI.

The Communication of the different Veſſels, with the Seminary Veſſels in the Body of Man.

AA. *The thick Parts of the different Veſſels endued with Subſtance and a ſmall Cavity.*

BB. *The Parts of the different Veſſels, endued with a thin Subſtance and a large Cavity.*

CC. *The Extremities of the Different Veſſels, ſtreightned again together, and gaping with a ſmall Hole into the Neck of the Seminary Veſſels.*

DD. *The Neck of the Seminary Veſſels divided into two Parts, by means of a certain intervening Membrane, to the end the Seed of the one ſide ſhould not mix with the Seed of the other, before it comes to the Ureter.*

EE. *The Seminary Veſicles diſtended with Wind.*

FF. *The Veſſels running through them.*

GGG. *The Membranes by which the Veſicles and different Veſſels are detained in their Situation.*

HH. *The Blood-bearing Veſſels runing out to the ſides of the different Veſſels, and embracing them with their ſmall Branches.*

I. *The Caruncle through the Pores of which the Seed burſts forth into the Ureter.*

KK. *The Channels of the Glandulous Body gaping into the Ureter, at the ſides of the Caruncle.*

LL. *The Glandulous Body divided in the Fore-part.*

MM. *The Ureter opened.*

FIGURE VII.

The ſame Letters with thoſe of the preceding Figure, as the one ſhewed the External, ſo theſe ſhew the Internal Subſtance of the Seminal Veſſels.

The EXPLANATION of the *Fifth* TABLE, In *Folio* 174.

This Table ſhews the Conſtitution of the Womb, and the Female Privities, and the Parts adjoyning, as well in Women with Child, as in empty Women.

FIGURE I.

The Womb containing an Embryo almoſt two Months gone.

A. THE *Womb.*

B. *The greateſt Vein among thoſe which are in the Superficies of the Womb.*

CC. *The Pendulous Teſticles.*

DDDD. *The Membrane of the Womb, to which the Shootings forth of the Veſſels adhere.*

E. *The Nympha.*

FF. *The Hair of the Privities.*

GG. *The Horns of the Womb, in the Superficies of which, appear little Veins, according to the Delineation of* Aquapendens. *But theſe we do not reckon to be the true Horns.*

H. *The Urinary Paſſage.*

II. *The Privity.*
KK. *The Wings.*

FIGURE II.

The Entrance of the VVomb divided according to its Length.

A. *The Orifice of the Womb.*
B. *The Neck of the Womb.*
C. *The Orifice of the Bladder.*
D. *The Neck or Sheath Divided.*

FIGURE III.

The Substance of the VVomb of a VVoman with Child divided, to shew the Cheescake.

AAAA. *The four Triangular Parts of the Womb reflexed outward.*
BBB. *The Cheescake of a tuberous and unequal Form.*
C. *The Membranous Substance of the Cheescake, thicker than the other Membranes which is annexed to the Womb, but here torn off to shew the Chorion.*
a. *The Chorion.*
D. *The Neck of the Womb divided.*

FIGURE IV.

The Genital Parts of an Empty VVoman.

A. *The Right Kidney Kernel.*
B. *The Left Kidney Kernel.*
CC. *The Kidneys on both sides.*
DD. *The Right Emulgent Veins.*
EE. *The Right Emulgent Arteries.*
FF. *The Trunk of the Hollow Vein divided into two Iliac Branches, the Right and Left.*
G. *The Left Emulgent Vein.*
HH. *The Left Emulgent Arteries.*
II. *The Right Spermatic Vein.*
K. *The Right Spermatic Artery.*
L. *The Left Spermatic Arterie.*
M. *The Left Spermatic Vein.*
NN. *The Trunk of the Great Artery divided into the Right and Left Iliac Branch.*
OO. *The Female Testicles.*
PP. *A Portion of the broad Ligament.*
QQQQ. *The Tubes of the Womb on each side.*
R. *The Bottom of the Womb.*
SS. *The round Ligaments of the Womb cut off below.*
T. *The Neck of the Womb.*
V. *The Hypogastric Vein on the Right Side.*
V. *The Hypogastric Artery on the Left Side.*
X. *The Hypogastric Artery on the Right Side.*
X. *The Hypogastric Vein in the Left Side, extended to the Womb.*
Y. *The Sheath of the Womb.*
Z. *The Urinary Bladder depressed above the Privity.*
aa. *A Portion of the Ureters cut off about the Bladder.*
bb. *A Portion of the Ureters cut off about the Kidneys.*
cc. *The Vessels preparing the Seed, dilated about the Testicles.*
c.d. *The Channel of the Testicles, or the different Vessel.*

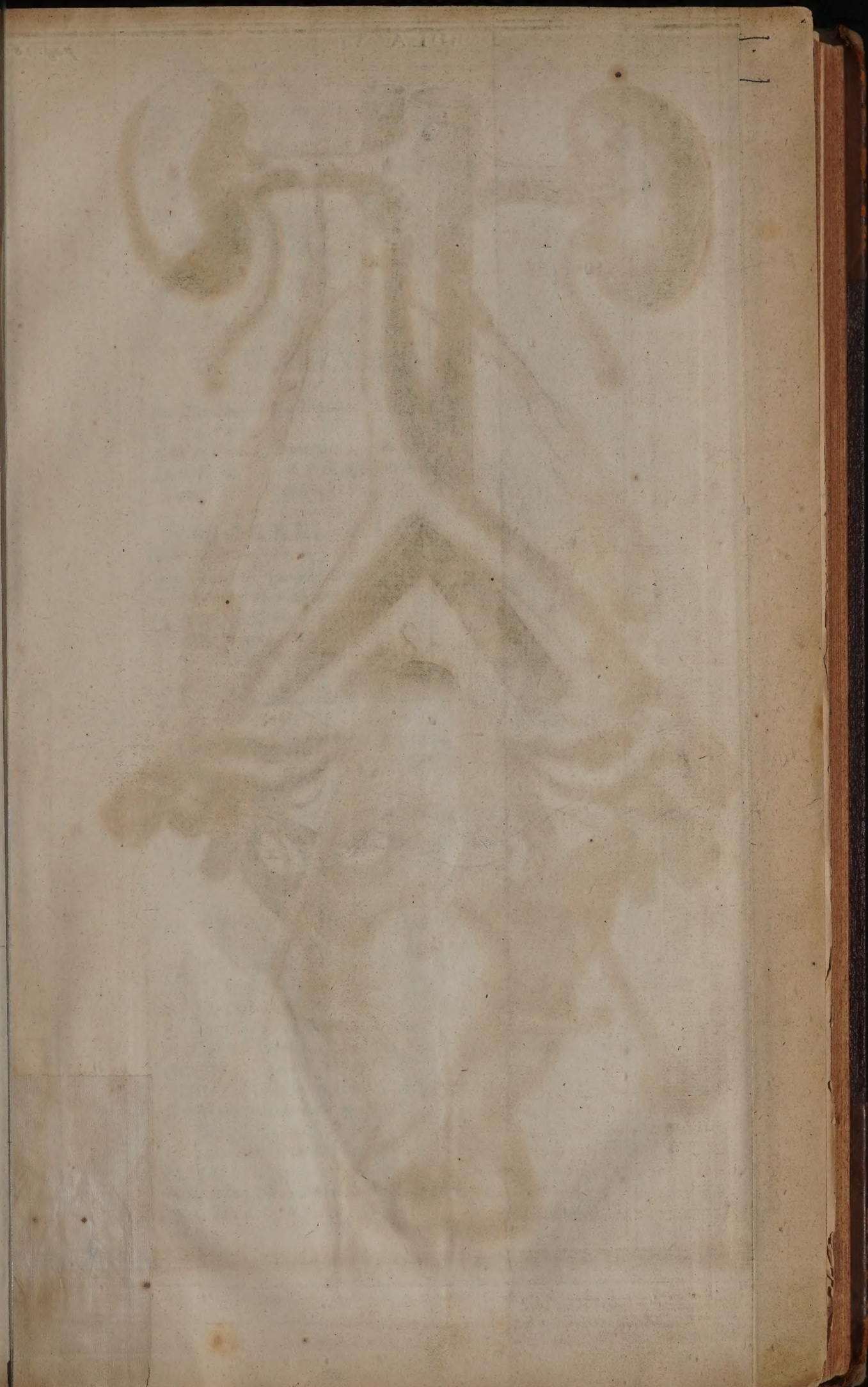
FIGURE V.

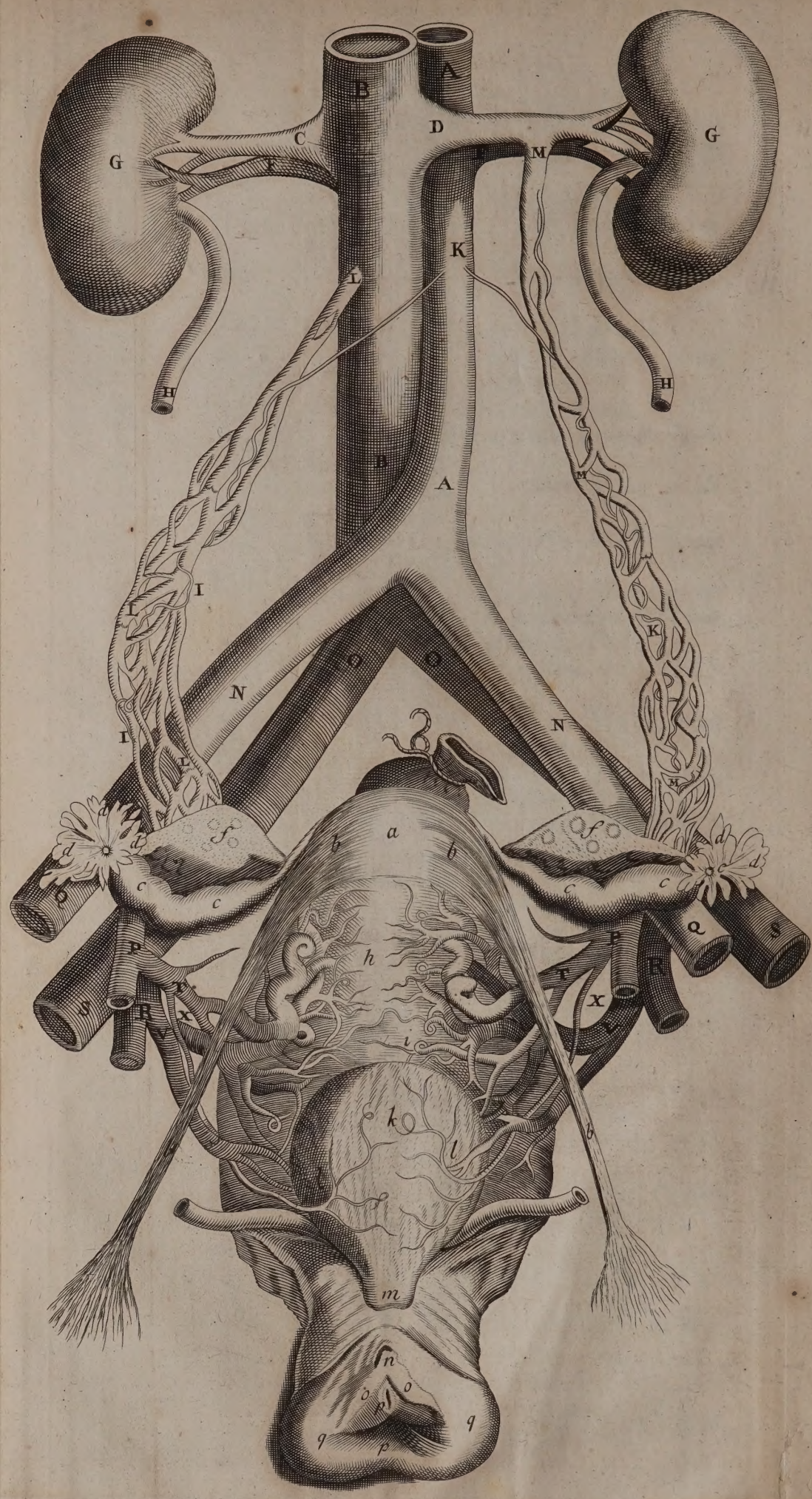
A. *The Right Testicle.*
BB. *The Right Tube depressed.*
C. *The Left Testicle.*
DD. *The Left Tube of the Womb.*
E. *The Bottom of the Womb.*
FF. *The round Ligaments of the Womb.*
G. *The Urinary Bladder inserted into the Sheath of the Womb.*
HH. *Portions of the Ureters.*
II. *The two musculous Supporters of the Clitoris.*
K. *The Body of the Clitoris it self.*

FIGURE VI.

AA. *The bottom of the Womb dissected athwart.*

D. *The*

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BB. *The Cavity of the Bottom.*
C. *The Neck of the Womb.*
D. *The little Mouth in the Neck of a Womans Womb which has born a Child.*
EE. *The wrinkl'd Prospect of the Sheath of the Womb dissected.*
FF. *The round Ligaments of the Womb cut off underneath.*

FIGURE VII.

The Womans Yard.

A. *The Nut of the Yard.*
B. *The Prepuce.*
CC. *The two Supporters.*
D. *The Chink not manifestly pervious.*

FIGURE. VIII.

AA. *The two spongie Bodys of the Yard dissected athwart.*
B. *The Nut of the Yard.*
C. *The Prepuce.*
DD. *The two Supporters.*

FIGURE IX.

A. *The Head of the* Clitoris *prominent under the Skin.*
BB. *The outward Lips of the Privity sundred one from the other.*
CC. *The Nymphæ sundred also.*
D. *The Caruncle plac'd about the Urinary passage* (a)
EE. *Two Myrtle-shap'd fleshy Productions.*
FF. *Two Membranous expansions containing the Chink.*

FIGURE X.

A. *Membrane spread athwart the Privity, taken for the Hymen.*

FIGURE XI.

This shews the Privities of a Female Infant, where the the Parts are the same as in *Fig. 9.*

The EXPLANATION of the *Sixth* TABLE in *Fol.* 186.

This shews the Genitals of Women taken out of the Body, and placed in their natural Situation, accurately delineated by *Regner de Graef.*

AA. THE *Trunk of the great Artery.*
BB. *The Trunk of the hollow Vein.*
C. *The Right Emulgent Vein.*
D. *The Left Emulgent Vein.*
E. *The Right Emulgent Artery.*
F. *The Left Emulgent Artery.*
GG. *The Kidneys.*
HHH. *The Ureters cut off.*
I. *The right Spermatic Artery.*
K. *The left Spermatic Artery.*
L. *The right Spermatic Vein.*
M. *The left Spermatic Vein.*
NN. *The Iliac Arteries.*
OO. *The Iliac Veins.*
PP. *The Internal Branches of the Iliac Artery.*
QQ. *The External Branches of the Iliac Artery.*
RR. *The Internal Branches of the Iliac Vein.*
SS. *The External Branches of the Iliac Vein.*
TT. *The Hypogastric Arteries carried to the Womb and Sheath.*
VV. *The Hypogastric Veins accompaning the said Arteries.*
XX. *Branches of the Hypogastric Artery shooting to the Piss-bladder.*

YY. *Branches of the Hypogastric Vein carry'd to the Bladder.*
ZZ. *Portions of the Umbilical Arteries.*
a *The bottom of the Womb wrapt about with its common Tunicle.*
bb. *The round Ligaments of the Womb, as they are joyn'd to the bottom of it.*
cc. *The Follopian Tubes in their natural Situation.*
dd *The rims of the Tubes.*
ee. *The holes of the Tubes.*
ff. *The Stones in their natural places.*
g. *A portion of the right Gut.*
h. *The Neck of the Womb, the common Tunicle taken off to shew the Vessels more conspicuously.*
i. *The Fore-part of the Sheath freed from the Piss-bladder.*
k. *The Piss-bladder contracted.*
l l. *Bloody Vessels running through the Bladder.*
mm. *The Sphincter Muscle girding the Neck of the Bladder.*
n. *The* Clitoris.
oo. *The* Nymphæ.
p. *The Urinary Passage.*
qq. *The Lips of the Privity.*
r. *The Orifice of the Sheath.*

The EXPLANATION of the *Seventh* TABLE In *Fol.* 245.

This Table shews the Secondines with the Umbilical Vessels, in a human *Embryo*, and the Parts differing from those of ripe Age exactly describ'd by *Casp. Bauhinus, Bartholine* and *H. Fab. ab Aquapendente.*

FIGURE. I.

AAAA. *THE Flesh of the Cheescake, or the Uterine Liver.*
BB. *The Amnios Membrane.*
C. *The Umbilical vessels.*
D. *The Umbilical Vein, and the two Umbilical Arteries.*

FIGURE II.

AAA. *The Amnios Membrane.*
B. *The Umbilical Vein and two Umbilical Arteries.*
CC. *The Chorion Membrane.*
DD. *The branches of the Veins and Arteries dispeirs'd through the* Chorion.
E. *The Conjunction of the Vessels of the Navel, as they are wrapt about with a little Tunicle resembling a little Gut.*

FIGURE III.

The Skeleton of a dissected Birth, differing in many things from a Man of grown years, as may be seen in the Text.

FIGURE IV.

Shews the length of the Umbilical Vessels from the Cheesecake to the Liver of the Infant, and the progress of the Umbilical Vein from the Navel to the Liver; also the Liver of the Birth and the Gall-bladder.

A. *The Cheesecake wrapt about with the* Chorion.
BBBB. *The Umbilical Vessels.*
CC. *The*

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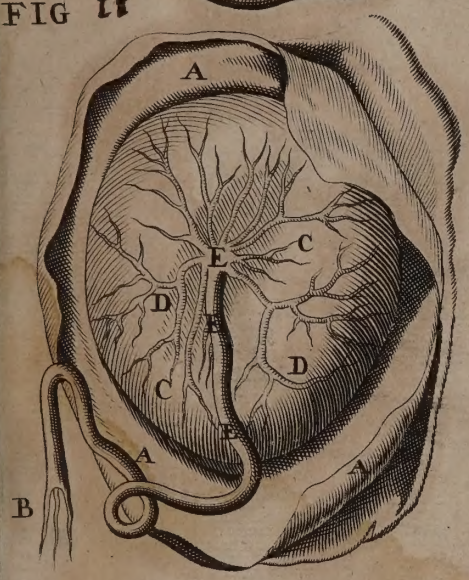
FIG II.



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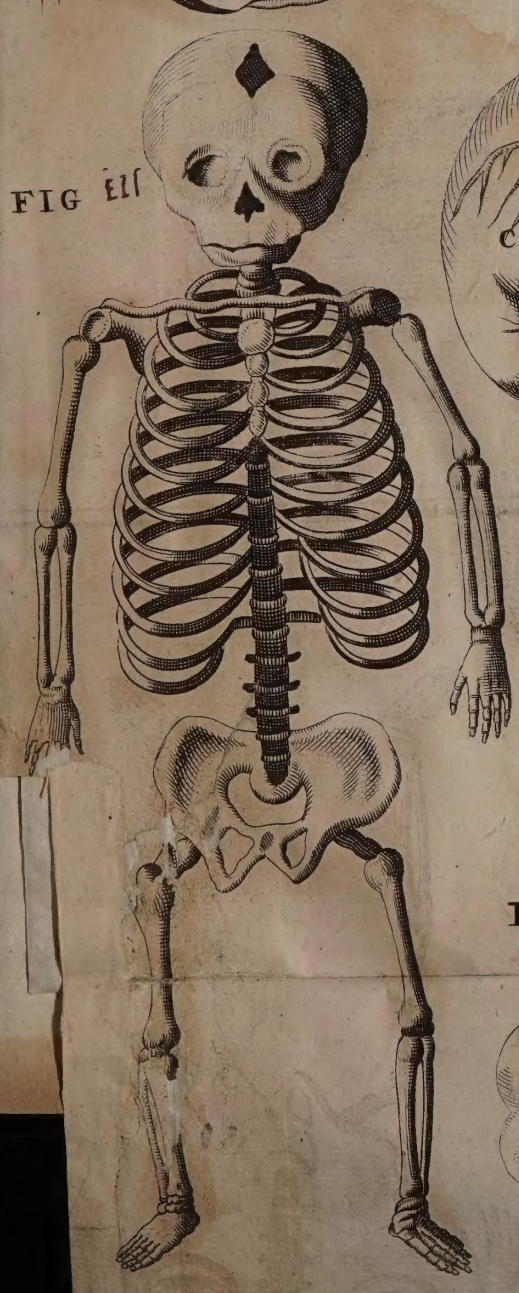

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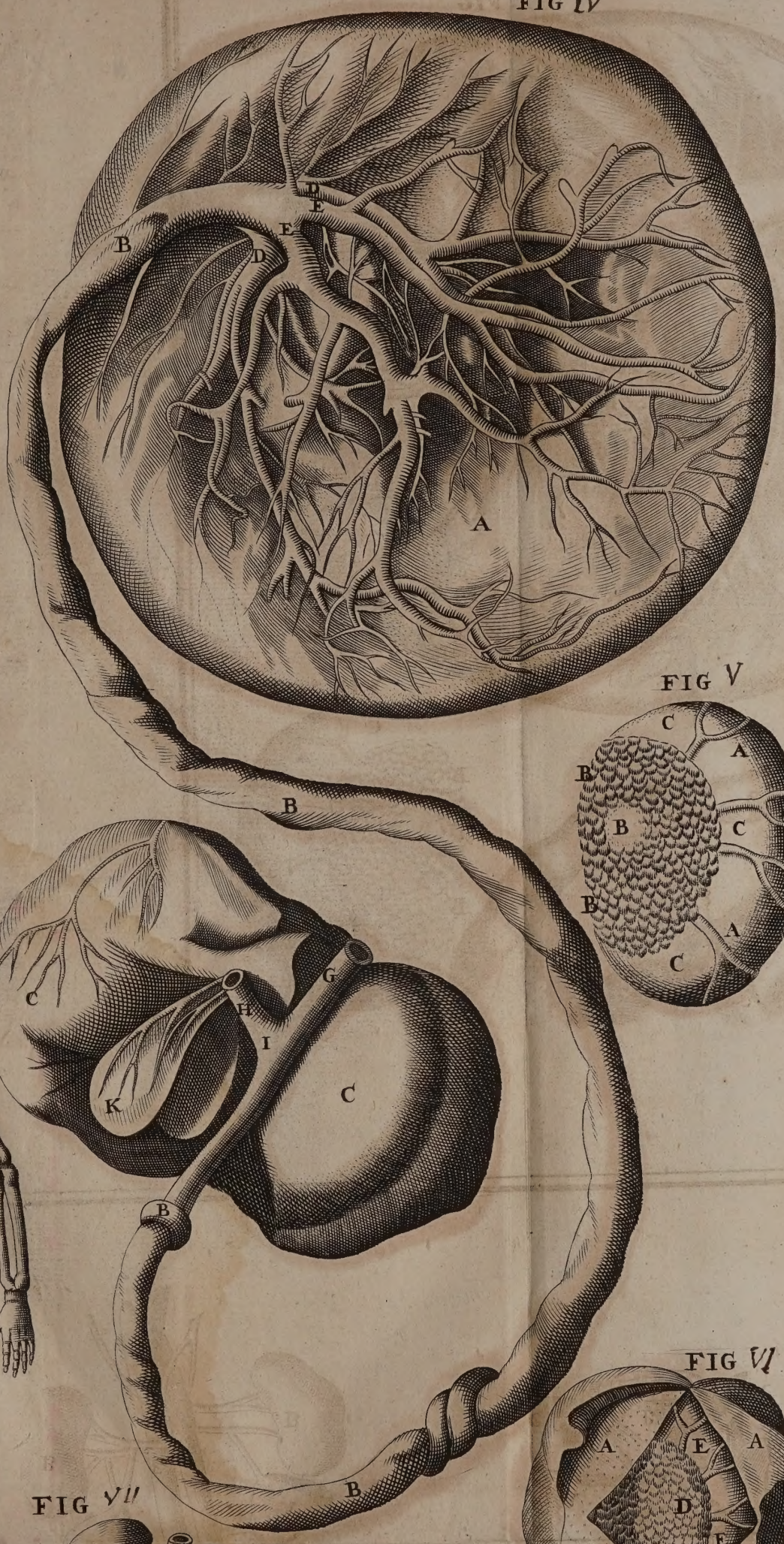
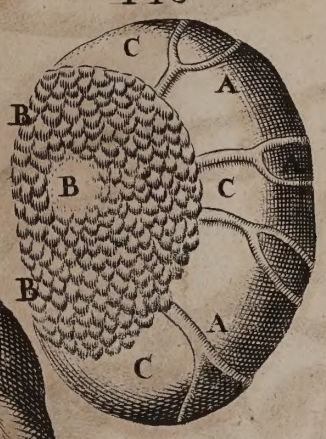


FIG V.



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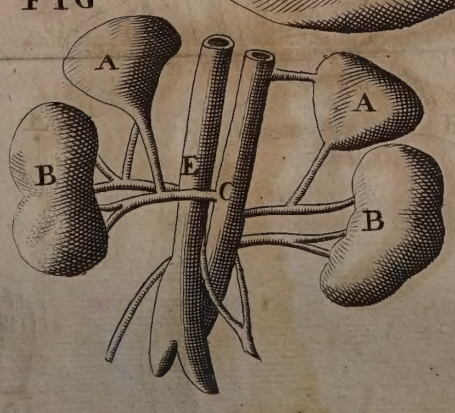

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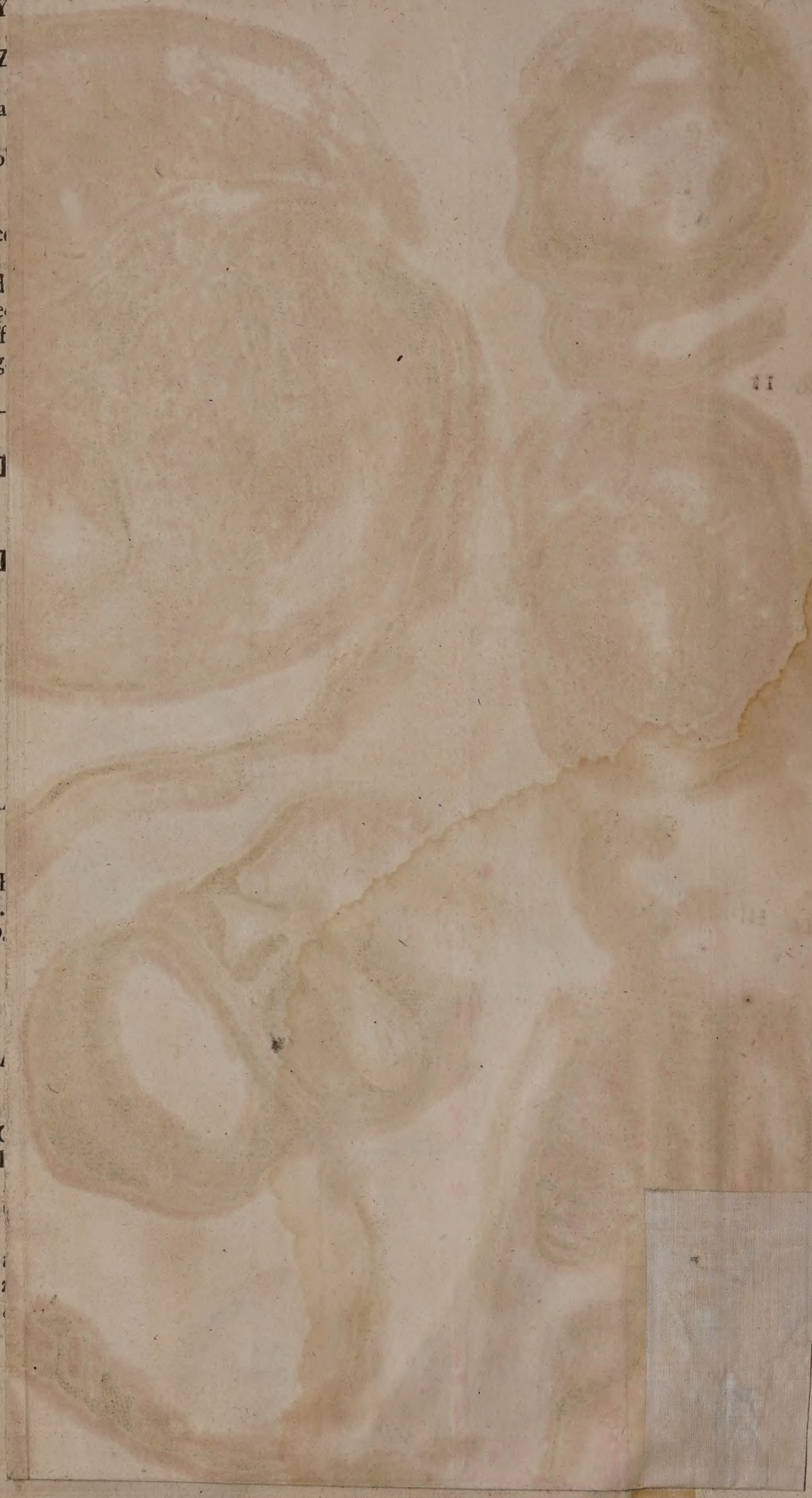

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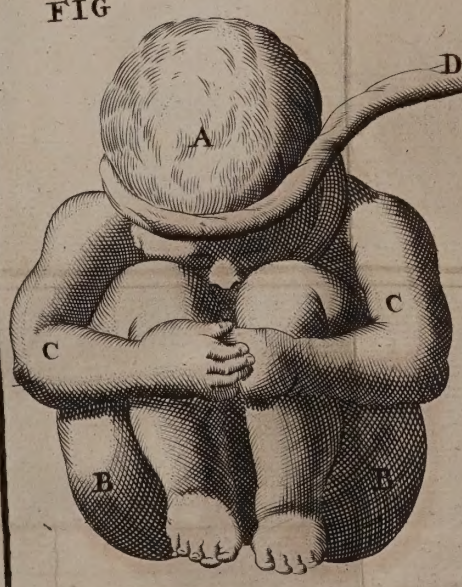

FIG

CC. *The Liver of the Infant.*
DD. *The two larger Branches of the Umbilical Vein ſlitting themſelves into leſſer.*
EE. *The Branches of the Umbilical Arteries.*
G. *The Trunk of the hollow Vein aſcending to the gibbious part of the Liver.*
H. *The Gate-veine.*
I. *The Umbilical Vein boaring the* Porta *and the hollow Vein.*
K. *The Gall-bladder.*
LLLL. *The Veſſels of the* Chorion, *or Branches of the Umbilical Veins and Arteries diſpeirſed through the* Chorion.

FIGURE. V.

AAA. *The outermoſt enfolding of the Birth call'd the* Chorion.
BBB. *The Fleſh growing to the outermoſt folding, or the Uterine Cheeſecake or Uterine Liver.*
CCC. *The Veſſels diſtributed.*

FIGURE VI.

AAAA. *The bottom of the Womb diſſected into four parts.*
B. *Part of the Neck of the Womb.*
CC. *The Veins and Arteries embracing the Neck of the Womb.*
D. *The Uterine Cheeſecake.*
EE. *The outermoſt enfolding of the Birth.*

FIGURE VII.

AA. *The ſubſtituted Kidneys.*
BB. *The true Kidneys diſtinguiſhed with ſeveral Kernels ill expreſſed by the Error of the Graver.*
C. *The great Artery, whence branches to the Capſulas and Kidneys.*
D. *The hollow Vein from whence the Emulgents, and little Veins of the Capſulas.*

The EXPLANATION of the *Eight* TABLE In *Fol.* 270.

This Table ſhews the Birth of the Womb deſcrib'd by *H. Fab. ab Aquapend.* and *G. Bartholinus.*

FIGURE I.

Shewing the Situation of the Birth, ſwimming upon the Moiſture, together with the Cheeſecake, and the *Chorion* annex'd to it.

A. THE *Cheeſecake with the* Chorion *annex'd.*
B. *The Umbilical Veſſels.*
C. *The Moiſture upon which the Birth ſwims.*
DDDD. *The four Parts of the Womb.*
E. *The Neck of the Womb.*
F. *The Sheath open'd.*
G. *The moſt remarkable Trunks of the Veſſels of the* Chorion.

FIGURE II.

Shewing the Situation of the Birth in the Womb; which however varies in others.

A. *The Head Prone with the Noſe hid between the Knees.*
BB. *The Buttocks to which the Heels are joyn'd.*
CC. *The Arms.*
D. *The Line drawn about the Neck, and reflex'd above the Forehead, and continuous to the Cheeſecake.*

FIGURE

FIGURE III.

Shews the Situation of the Birth now endeavouring to come forth.

A. *The Head of the Infant.*
B. *The Privity.*
CCCC. *The upper Parts of the* Abdomen *taken away with a Pen-knife.*

The EXPLANATION of the *Ninth* TABLE In *Fol.* 326.

Shewing the Heart with its Veſſels in its Situation, with the Ventricles and Valves belonging to the ſame: together with the Lungs in their Situation, the Rough Artery and *Diaphragma.*

FIGURE I.

A. THE Pericardium *enfolding the Heart.*
BB. *The Lungs embracing the Heart in their natural Situation.*
C. *The hollow Vein aſcending above the Heart.*
D. *The Original of the* Azygos *Vein.*
E. *The right Subclavial Vein.*
F. *The right Jugular Vein.*
G. *The left Jugular Vein.*
H. *The left Subclavial Vein.*
II. *The right and left* Carotis *Artery.*
KK. *The right and left Subclavial Artery.*
LL. *The Nerves of the ſixth pair deſcending to the Lungs.*
M. *The Original of the great Artery deſcending.*

FIGURE II.

A. *The* Pericardium *taken from the Heart.*
B. *The Heart ſpread over with the* Coronarie *Veins and Arteries.*
C. *The Trunk of the great Artery ſhooting out of the Heart.*
D. *The deſcending Portion of it turned upward.*
EE. *The Arterious Vein diſtributed toward the Left hand to the Lungs.*
F. *The Channel between the Arterious Vein and the great Artery, conſpicuous only in the new born Birth but dry'd up in thoſe of riper Age.*
G. *The right Branch of the Arterious Vein.*
HH. *The right and left Branch of the veiny Artery.*
I. *The Auricle of the Heart.*
KK. *The Lungs adjoyning to the Heart.*
L. *The Proper Tunicle of the Lungs ſeparated.*

FIGURE III.

Shewing the Heart of an Infant entire.

A. *The Proper Membrane of the Heart ſeparated.*
B. *The* Parenchyma *of the Heart bare.*
CC. *The right and left Auricle of the Heart.*
D. *The great Artery iſſuing out of the Heart.*
E. *A portion of the hollow Vein ſtanding without the Heart.*

FIGURE

Tab. IX.

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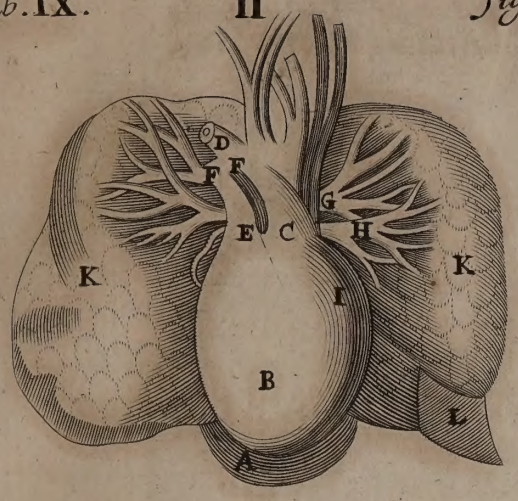

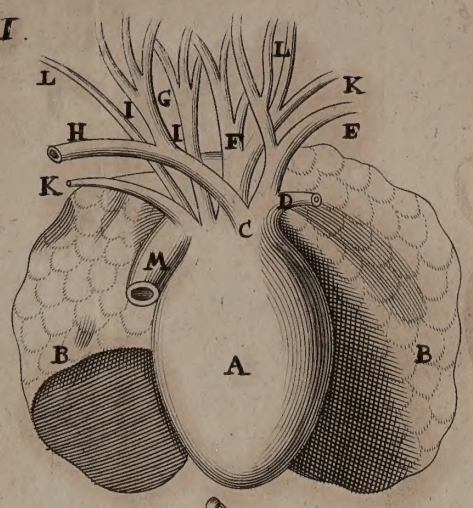

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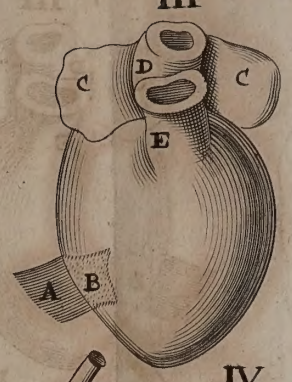

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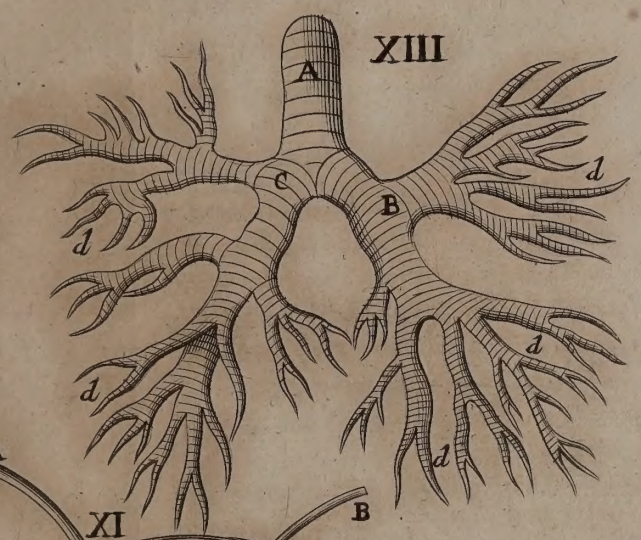

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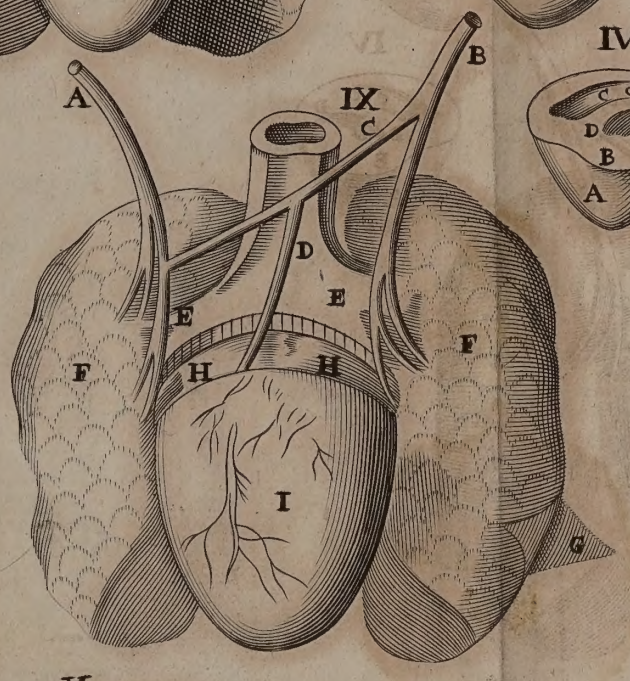

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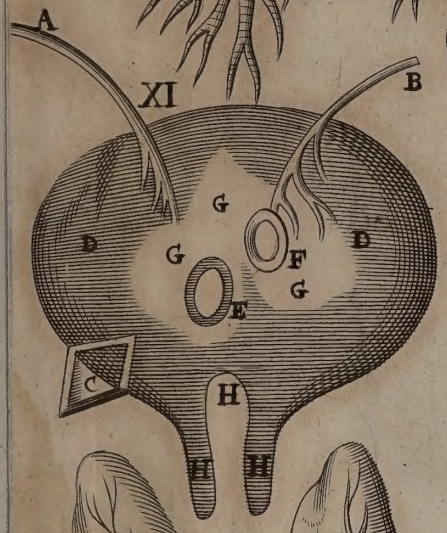

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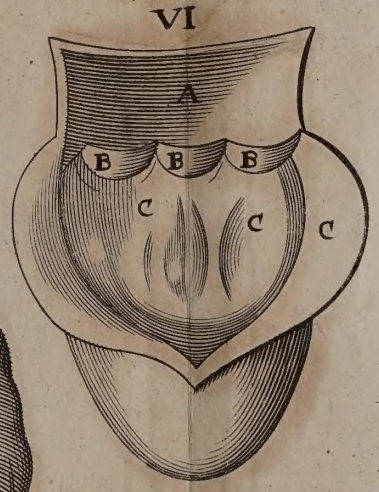

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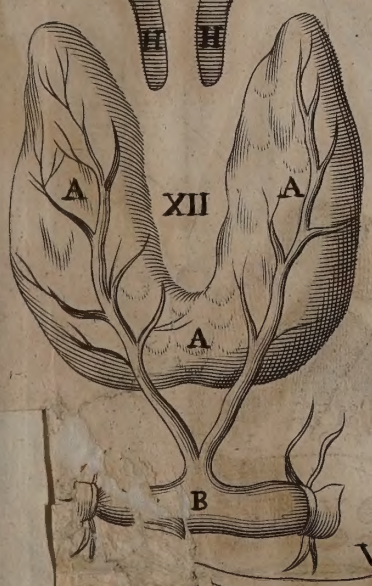

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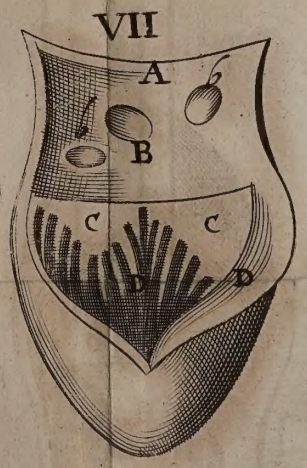

V

VIII

FIGURE IV.

A. *Part of the Heart cut athwart.*
B. *The left Ventricle.*
CC. *The right Ventricle.*
DD. *The Fence of the Heart.*

FIGURE V.

The inside of the Heart.

A. *The Orifice of the Coronary Vein.*
B. *An Anastomosis between the hollow Vein and the veiny Artery, conspicuous only in new born Infants, in ripe years consolidated.*
CCC. *The treble pointed Valves.*
DDD. *The right Ventricle of the Heart open'd.*
aa. *Passages terminating in the Fence.*

FIGURE VI.

A. *The Arterious vein dissected in the right Ventricle.*
BBB. *The* Semilunary *or* Sigmoides *Valves, in the Orifice of the said Vein.*
CCC. *The right Ventricle of the Heart open'd.*

FIGURE. VII.

A. *The Arterious Vein dissected.*
B. *A mark of the* Anastomosis *between the veiny Artery and the hollow Vein, as being only to be seen in the Birth.*
bb. *Passages terminating in the Fence within the Membranes.*
CC. *Two Miterelike Valves seated in the left Ventricle at the entrance of the Arterious Vein.*
DD. *The left Ventricle of the Heart open'd.*

FIGURE. VIII.

A. *The great Artery dissected near the Heart.*
BBB. *The* Semilunar *Valves belonging to it.*
CC. *The left Ventricle of the Heart.*
D. *Part of the left Ventricle reflexed.*

FIGURE IX.

AB. *A right and left Nerve of the sixth pair, to the Lungs.*
C. *A middle Branch between each Nerve.*
D. *An Excursion of the same to the* Pericardium.
EE. *Two larger Branches of the rough Artery, Membranous behind.*
FF. *The hinder Part of the Lungs.*
G. *The proper Membrane of the Lungs separated.*
HH. *A remainder of the* Pericardium.
I. *The Heart in its place, with the* Coronary *Vessels.*

FIGURE X.

AAA. *The inner Superficies of the* Sternon, *and Gristles connex'd.*
BB. *The Mammary Veins and Arteries descending under the* Sternon.
C. *The glandulous Body called the* Thymus.
DDDD. *The sides of the* Mediastinum *pull'd off.*
EE. *A hollowness caused by a vulsion of the* Sternon, *between the Membranes of the* Mediastinum.
F. *The Protuberancy of the* Mediastinum, *where the Heart is seated.*
GG. *The Lungs*
HH. *The* Diaphragma.
I. *The Sword resembling Gristle.*

FIGURE. XI.

The Diaphragma.

AB. *The right and left Nerve of the* Diaphragma.
C. *The upper Membrane of it separated.*
D. *The fleshy substance of it bare.*
F. *The Hole for the hollow Vein.*

GGG. *The Membranous Part or Center of the* Diaphragma.
HHH. *The Appendixes of the ſame between which the great Artery deſcends.*

FIGURE XII.

The glandulous Body ſeated by the *Larynx*.

AAA. *The Kernels growing to the* Larinx.
B. *A portion of the Jugular Vein, two Branches of which paſs forward through the ſaid Kernels.*

FIGURE XIII.

The *Aſpera Arteria* taken out of the Lungs.

A. *The rough Artery cut off below the* Larynx.
B. *The right Branch of it, divided firſt twofold; afterward into ſeveral* Bronchia.
C. *The left Branch divided in like manner.*
dddd. *The Extream Parts of the Branches terminating in little Membranous Channels.*

The EXPLANATION of the *Tenth* TABLE In *Fol.* 357.

Shewing the *Bronchial* Artery diſcover'd by *Frederic Ruyſch*; together with the ſubſtance of the Lungs as it was obſerved by *Malpigius*.

FIGURE I.

The Ramification of the Bronchial Artery.

A. *THe hinder Part of the* Aſpera Arteria, *of a Calf cut off from the* Larynx.
B. *The right Branch.*
C. *The left Branch.*
D. *The Bronchial Artery, the little Branches of which accompany the* Bronchia *to the end.*
E. *The hinder part of the deſcending Artery, from whence the Intercoſtals proceed.*
F. *The uppermoſt Branch, to be found in Calves and Cows only.*

FIGURE II.

This and the following ſhew the ſubſtance of the Lungs.

The outermoſt Piece of the Lungs dry'd containing the Net as it is delineated.

FIGURE III.

The Inner Veſicles and hollowneſſes ſhaddow'd, with a particle of the ſpace in the upper part annex'd. But the Original and entire Propagation could not be expos'd to the Eye by the Graver's Art.

FIGURE IV.

The various concinnation of the Lobes, above the Trachea *and* Pulmonary *Veſſels, which are ſhewn as taken out from their natural Situation.*

FIGURE V.

The Lungs of Frogs, with the *Trachea* annex'd.

A. *The* Larynx, *which is half griſtly.*

B. *A*

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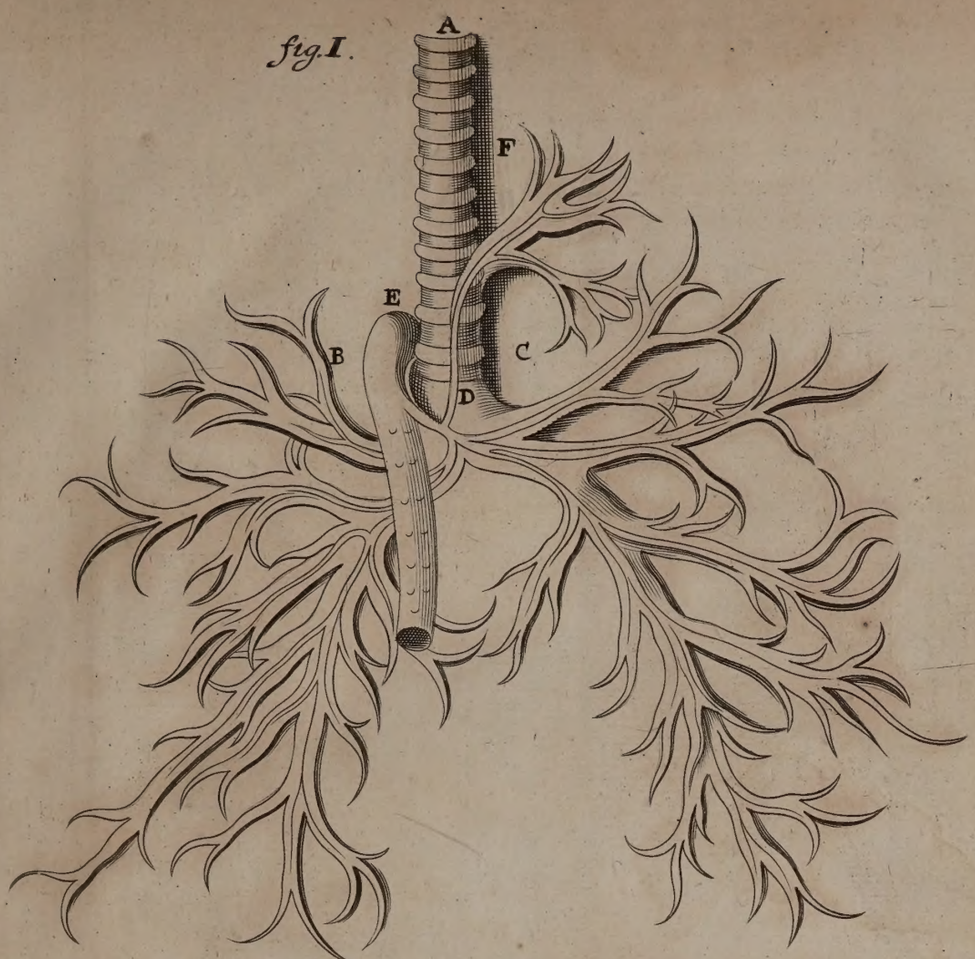

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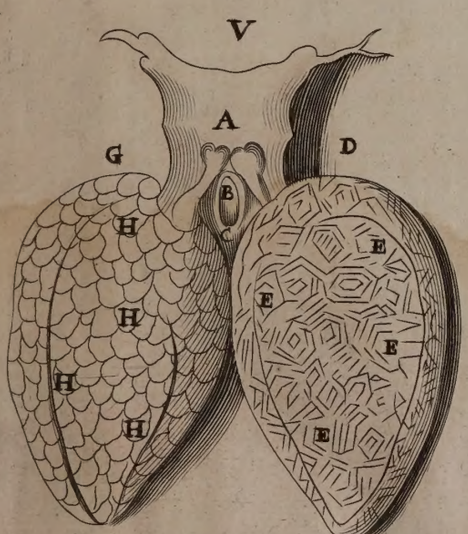

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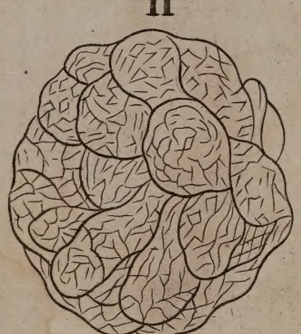

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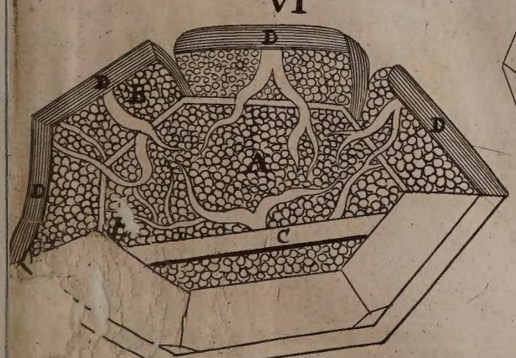

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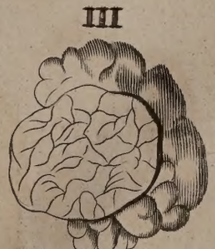

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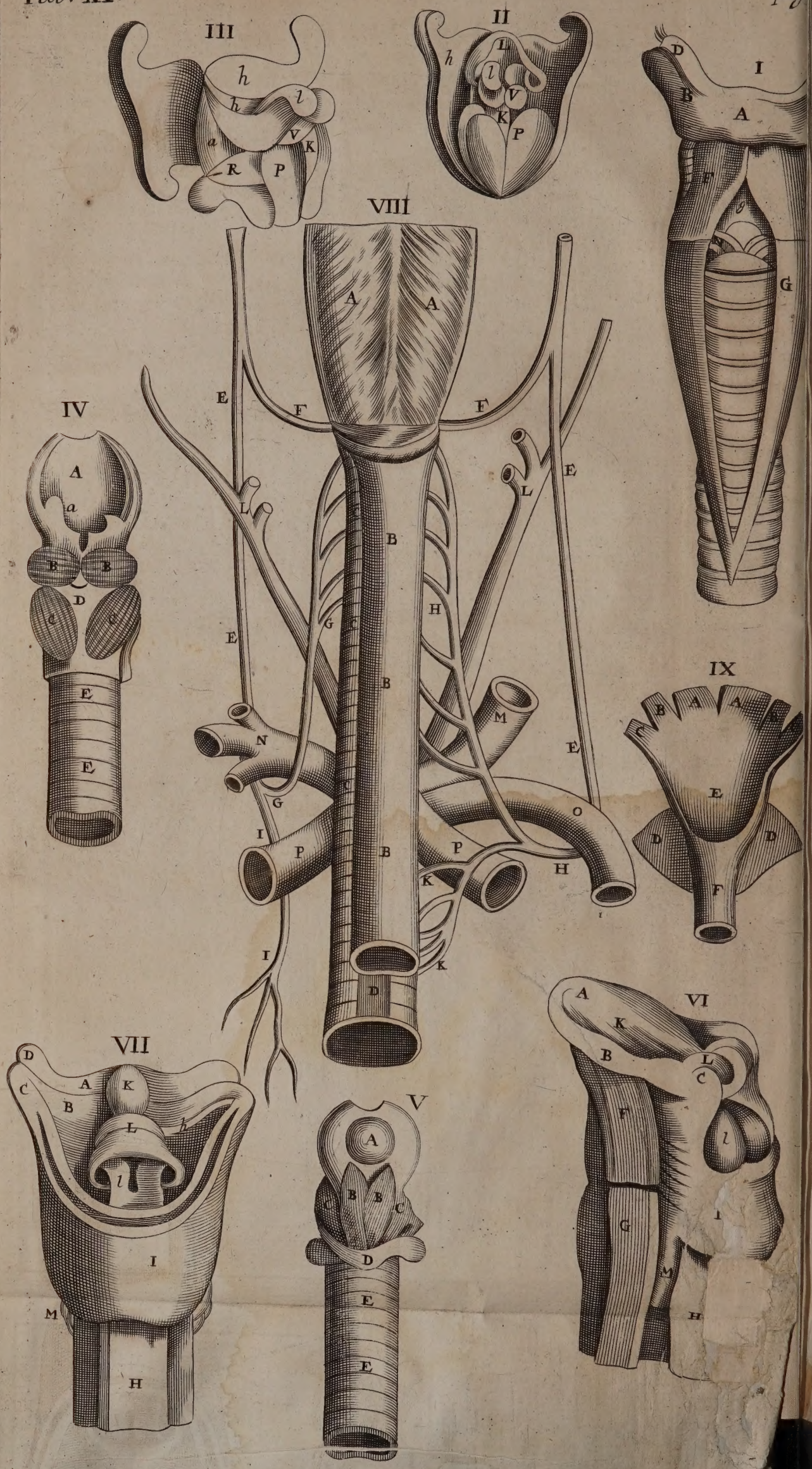
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B. *A little Chink, which is exactly closed at the Will of the Animal, and being closed, keeps the Lungs Swelled with Air.*
C. *The Seat of the Heart.*
D. *Part of the Exterior Lungs.*
E. *The propagated Net of the Cells.*
F. *The Propagation of the Pulmonary Artery.*
G. *The Hollow Part of the Lung cut in the middle.*
H. *The Propagation of the Pulmonary Vein, shooting forth to the tops of the Sides.*

FIGURE VI.

Shews the meer Cell, without the intervening Sides, encreased in Magnitude.

A. *The inner Area of the little Cell.*
B. *The Sides torn away and stopped.*
C. *The Trunk of the Pulmonary Artery, with the Branches Appendent, terminating as it were in Net-work.*
D. *The Trunk of the Pulmonary Vein, wandring with its running Branches over the Tops of the Sides.*
E. *A Vessel at the Bottom, common as well to the lateral Angles of the Sides, as to the continued Ramifications of the Net.*

The EXPLANATION of the *Eleventh* TABLE In *Folio* 370.

Shewing the Larynx with its Muscles; as also the *Aspera Arteria*, the Gullet, the recurring Nerves, and the upper Part of the Throat, with its Muscles.

FIGURE I.

The Prospect of the Larynx before.

A. *THE Hyoides Bone covered with certain little Membranes.*
B. *The lower Side of the Hyoides Bone.*
D. *The upper Side.*
F. *The Second Pair of Muscles, common to the Larynx.*
G. *The Second Pair of common Muscles, ill described about the Original being so narrow.*
N. *The First Pair of Muscles proper to the Larynx.*
I. *Part of the Shield-resembling Gristle.*

FIGURE II.

The hinder Part of the Larynx.

L. *The Epiglotis.*
H. *The Guttal Gristle.*
V. *The Ninth Muscle of the Larynx.*
K. *The hinder Part of the annular Gristle.*

FIGURE

FIGURE III.

The hinder Lateral Proſpect of the Larynx.

V. *The Ninth Muſcle of the Larynx.*
P. *The Second Pair of the Muſcles of the Larynx.*
R. *The Third Pair of the Muſcles proper to the Larynx.*
a. *The Right Muſcle of the fourth Pair of Muſcles, proper to the Larynx.*
b. *The upper Part of the ſame left Muſcle.*
h. *The Proſpect of the Shield-reſembling Muſcle behind.*
i. *The Proſpect of the Annular Muſcle before.*
k. *The hinder Proſpect of the ſame.*
l. *The Guttal Griſtle.*

FIGURE IV.

A. *The inner Face of the Epiglottis.*
aa. *The Prominences of the Arytenoides Griſtles.*
BB. *The Arytenoides Muſcles every way looſe.*
CC. *The hinder Crycoartenoides Muſcles.*
D. *The broader Part of the Annular Griſtle.*
EE. *The hinder Membranous Part of the Aſpera Arteria.*

FIGURE V.

A. *The External Face of the Epiglottis joyned to the Larynx.*
BB. *The Thyroartenoides Muſcles.*
CC. *The lateral Crycoartenoides Muſcles.*
D. *The Crycoides Griſtle.*
EE. *The Fore-part of the Aſpera Arteria.*

FIGURE VI.

The Lateral Face of the Larynx.

A. *The Hyoides Bone ſtill covered with certain ſmall Griſtles.*
B. *The lower Side of the Hyoides Bone.*
C. *The upper Proceſs of the Scutiform Griſtle.*
F. *The ſecond pair of Common Muſcles to the Larynx.*
G. *The firſt Pair of common Muſcles.*
H. *The Throat.*
I. *The Swallowing Muſcle, which others call the third Pair.*
K. *The Place of the Muſcles of the Epiglottis in Brutes that chew the Cud, which is wanting in Men.*
l. *The Guttal Griſtle.*
g. *The Fore-part of the Scutiform Griſtle.*
M. *The Kernels of the Larynx, annexed to the Root, at the Sides of the Aſpera Arteria.*

FIGURE VII.

A. *The Hyoides Bone ſtill covered with little Membranes.*
B. *The lower Side of it.*
C. *The upper Side of the Scutiform Griſtle.*
D. *The upper Side of the Hyoides Bone.*
K. *The Place of the Muſcles of the Epiglottis in Brutes.*
L. *The Epiglottis.*
h. *The Fore-part of the Scutiform Griſtle.*
L. *The Epiglottis.*
M. *The Kernels faſtned to the Root of the Larynx.*
H. *The Throat.*

FIGURE

FIGURE VIII.

The *Aspera Arteria* and Gullet, with the recurring Nerves, on the hinder Part.

AA. *The Muscle drawing the Gullet together.*
BBB. *The Gullet.*
CCC. *The Aspera Arteria under the Throat.*
D. *The Membranous Part of it.*
EEEE. *The Nerves of the Sixth Conjugation.*
FF. *Nerves inserted into the Tongue behind.*
GG. *The Right recurring Nerve turned back to the Humeral Artery.*
HH. *The Left recurring Nerve wound about the descending Trunk of the Great Artery.*
II. *A Nerve tending to the sinister Orifice of the Ventricle, and the Diaphragma.*
KK. *A Nerve descending to the Diaphragma.*
LL. *The Jugular Arteries, of each side one.*
M. *The Left Humeral Artery.*
N. *The Right Humeral Artery.*
O. *the great Artery.*
PP. *Stumps of the Pulmonary Arteries.*

FIGURE IX.

The upper Part of the Throat, with its Muscles.

AA. *The Cephalopharyngean Muscles.*
BB. *The Sphænopharyngean Muscles.*
CC. *The Stylopharyngean Muscles.*
DD. *The Sphincter of the Throat divided.*
E. *The inner Face of the Throat.*
F. *The outer Face of the Throat.*

The EXPLANATION of the *Twelfth* TABLE, In *Folio* 418.

This Table, delineated by *Willis*, ſhews the Originals of the Nerves of the Fifth and Sixth Pair (according as he numbers them) and the Roots of the Intercoſtal Nerve, proceeding from them: Alſo the Originals of the ſame Intercoſtal Nerve, and the Vagous Pair, and of the Nerve proceeding from the Spine to the Vagous Pair, carried along to the Region of the Ventricle. Moreover, it repreſents the Originals and Diſtributions of the Nerves of the Seventh, Ninth, and Tenth Pair, and of the Nerve of the Diaphragma. In the ſame alſo are deſcribed the Originals of the Vertebral Nerves, and their Communications with the Former, as they are to be found in Men. But it is to be obſerved, that *Willis*, in this Table, does not follow the Ancient (which we obſerve in our Deſcription) but his own new Computation of the Number of the Nerves. VVhence it comes to paſs, that what we in our Text call the Third, he calls the Fifth; what we the Fifth, he calls the Seventh; what we the Seventh, he calls the Eight Pair.

AAA. *A Nerve of the Fifth Pair, with the two Branches of it*: AA. *of which the uppermoſt tending up-right before, diſtributes ſeveral Sprigs to the Muſcles of the Eyes and Face, to the Noſe, Pallate, and upper Part of the whole Mouth. Beſides, two little Branches*, aa. *which are the two Roots of the Intercoſtal Nerve. The other lower Branch of the Fifth Pair, tending downward, is diſpierſed into the lower Jaw and all the Parts of it.*

aa. *The two Sprigs ſent from the upper Branch of the fifth Pair, which together with the other little Sprig*, b. *cloſing with the Nerve of the Sixth Pair, conſtitute the Trunk*, D. *of the Intercoſtal Nerve.*

B. *A Nerve of the Sixth Pair, tending ſtreight forward before to the Muſcles of the Eye; from the Trunk of which, the Sprig* b. *which is the third Root of the Intercoſtal Nerve, is reflexed.*

bbb. *The third Root of the Intercoſtal Nerve.*

C. *The Original of the Auditory Nerve, or of the Seventh Pair, with its double Proceſs, ſoft and hard.*

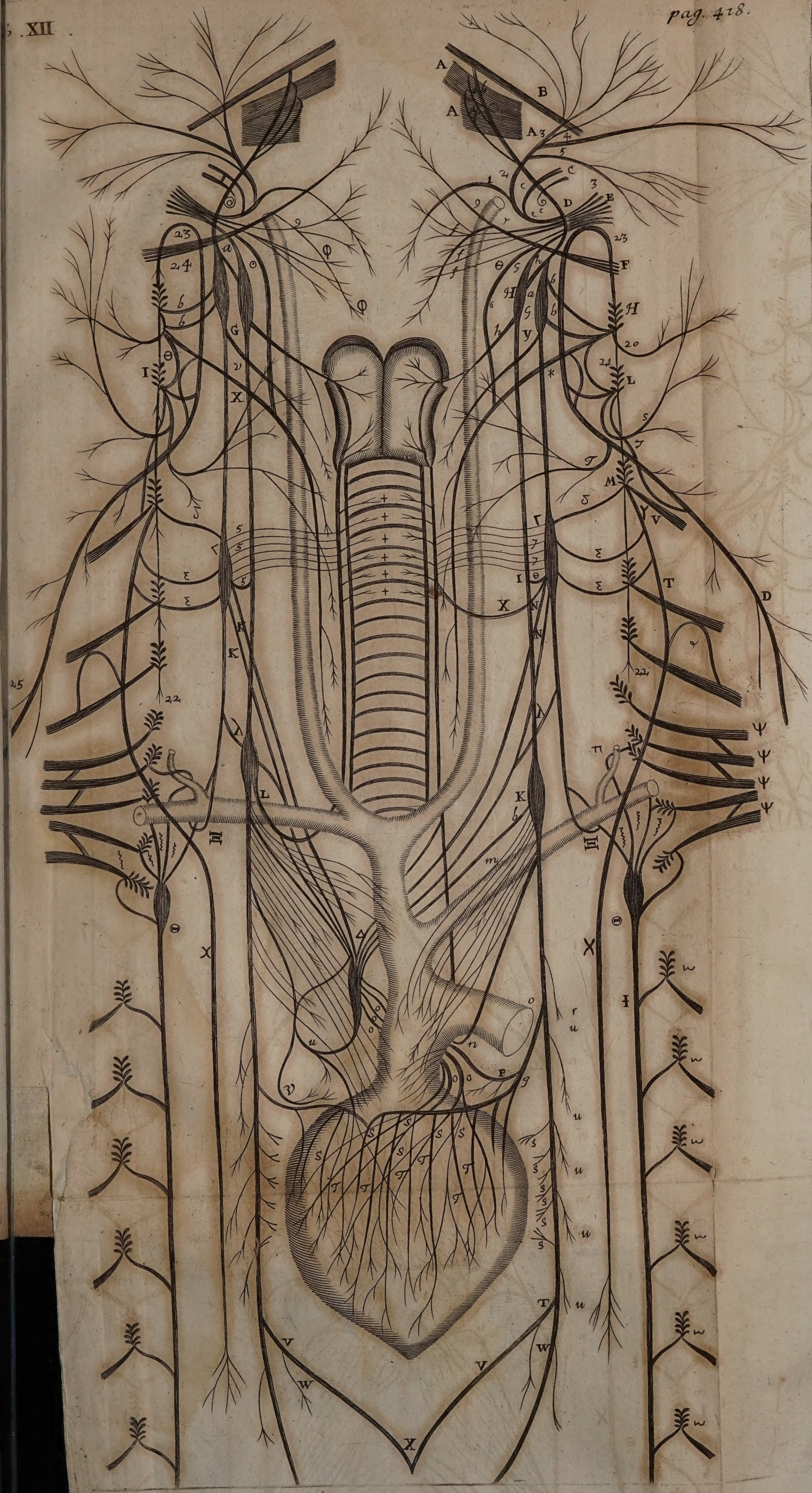
c. *The ſofter Branch of it, which is entirely diſtributed into the inner Part of the Ear, into the Muſcle which elevates the Hammer, and into the Cochlea.*

c. *The harder Branch, which riſing whole out of the Cranium, and ſlightly touching the Slip* E. *of the Eighth Pair, together with that makes a particular Nerve, which is preſently divided into ſeveral Branches, of which, the*

1. *Terminates in the Muſcles of the Tongue and Hyoides Bone.*

2. *Is again divided into ſeveral Slips; of which the Uppermoſt*

3. *Ends*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3. *Ends in the Muſcles of the Face and Mouth.*
4. *In the Muſcles of the Eye-lids and Fore-head.*
5. *In the Muſcles of the Ear.*

D. *The Trunk of the Intercoſtal Nerve, conſiſting of the three foreſaid Roots, being about to paſs the Ganglio-form'd Fold. Which Fold ſeems to be the uppermoſt Node of the Intercoſtal Nerve, produced without the Cranium.*

E. *The Original of the Nerves of the Vagous Pair, conſiſting of many Fibres, to which a Nerve riſing from the Spine joyns it ſelf, and inoculated with them, paſſes the Cranium; which being croſſed, it goes away, and after Communication with ſome of the adjoyning Nerves, ends in the Muſcles of the Scapula and Back.*

e. *A little Sprig of the Eight Pair, Meeting the Auditory Branch.*

fff. *Other Slips of the Vagous Pair, tending to the Muſcles of the Neck.*

G. *The principal Branch of the ſame Pair, terminating in the proper Ganglio-form'd Fold.*

H. *The upper Ganglio-form'd Fold of the Vagous Pair, I add which admits the little Sprig* K. *from the other adjoyning Fold of the Intercoſtal Nerve.*

hh. *A Branch from the foreſaid Fold of the Vagous Pair, into the Muſcles of the Larynx, a remarkable Branch of which paſſing under the Scutiform Griſtle, meets the recurrent Nerve, and is united to it.*

i. *A ſmall Twig from the Cervical Fold of the Intercoſtal Nerve, inſerted into the Trunk of the Vagous Pair.*

KK. *The lower Fold of the Vagous Pair, from which ſeveral Nerves proceed to the Heart and its Appendix.*

l. *A remarkable Sprig ſent to the Cardiac Fold.*

m. *Nervous Fibres diſtributed into the Heart and Cardiac Fold.*

n. *The Left recurrent Nerve, which being wound about the deſcending Trunk of the Aorta, and reflex'd upwards towards the Scutiform Griſtle in its aſcent, imparts many Slips* xxxx. *to the Aſpera Arteria; and laſtly, meets the ſmall Twig* h. *ſent from the Ganglio form'd Fold. This Recurrent, by means of its being reflected, ſends certain Branches alſo to the Heart.*

L. *The recurrent Nerve in the Right Side, which being reflected much higher, twines about the Axillary Artery.*

o. *A remarkable Branch ſent from the Trunk of the Vagous Pair in the Left Side; which being preſently divided, one Sprig of it winds about the Trunk of the Pneumonic Vein; the other touching the hinder Region of the Heart, is ſcattered into ſeveral Slips, which cover the Superficies of it. This is alſo met by the Cardiac Branch, ſent from the Trunk of the other.*

p. *A Sprig of the foreſaid Branch encompaſing the Pneumonic Vein.*

q. *The other Branch of the ſame, imparting many Shoots to the Heart, which Shoots cover the hinder Superficies of it.*

rrrr. *Small Shoots ſent forth from the Trunk of the Vagous Pair, which after a long Courſe, are inſerted into the Oeſophagus; reflexed beyond their proper Situation.*

ssss. *Many little reflexed Sprigs, whoſe Ramifications being diſtributed into the Subſtance of the Lungs variouſly bind and tye the Blood-bearing Veſſels.*

TTT. *The Trunk of the Vagous Pair is divided into two Branches, the outer and inner, both which bending toward the like Branches of the other ſide, are united to them, and after mutual Communication, conſtitute the two Stomachic Branches, and upper and lowermoſt*

VV. *Inner Branches, which being united into* X. *conſtitute the Original of the Lower Stomachic Branch.*

WW. *The External Branches, which constitute the upper Stomach Branch.*

X. *The closing of the inner Branches.*

F. *The Original of the Ninth Pair, with many Fibres which united, make a Trunk that is carried toward the Tongue; nevertheless, in its Progress, sending forth two Sprigs.*

ΘΘ. *The first tending downwards, and united to the Branch of the Tenth Pair, terminates in the Sternothyroides Muscle.*

φφ. *The second Sprig, ending in the Muscles of the Hyoides Bone.*

99. *A Trunk of this Nerve passing into the Body of the Tongue.*

G. *The upper Ganglio-form'd Fold of the Intercostal Nerve, which is the uppermost Node of this Nerve, when it is got out of the Brain.*

a. *A Sprig sent forth from this Fold into the Neighbouring Fold of the Vagous Pair.*

bb. *Two Nervous Processes, by means of which, this Nerve communicates with the Nerve of the Tenth Pair.*

γ. *A Sprig sent to the Sphincter of the Throat.*

L. *The Cervical or middle Fold proper to Man, which is placed in the middle of the Neck in the Trunk of the Intercostal Nerve.*

ϱ. *A remarkable Branch from the second Vertebral Pair into this Fold, by means of which, this Branch communicates with the Nerve of the Diaphragma, in its first Root.*

ss. *Two Branches from the same Fold into the Trunk of the Nerve of the Diaphragma.*

55. *Several nervous Fibres from the Cervical Fold to the Recurrent Nerve.*

θ. *A Twig from the same to the Trunk of the Vagous Pair.*

χ. *Another remarkable Sprig into the Recurrent Nerve.*

xx. *Two remarkable Branches sent toward the Heart, which the other* λ. *rising a little below, overtakes: These being carried downward, between the Aorta, and the Pneumonic Artery, meeting the Parallel Branches of the other side, make the Cardiac Fold* Δ. *from which the principal Nerves that terminate in the Heart proceed.*

λ. *A Branch proceeding somewhat beneath from the Intercostal Trunk, which with the former is designed to the Cardiac Fold.*

Δ. *The foresaid Cardiac Fold.*

μ. *A little Lappet proceeding from the same which winds about the Pneumonic Artery.*

γ. *The lower Lappet binding the Pneumonic Vein.*

z. *The Intercostal Nerve that sinks into the Cavity of the Breast, where it binds the Axillary Artery.*

ζζζ. *Four Vertebral Nerves sent to the Thoracic Fold, of which, the uppermost binds the Vertebral Artery.*

ooo. *Three remarkable Nerves sent from the Cardiac Fold, which overspread the Fore-Region of the Heart, as the Nerves* P.q. *proceeding from the Trunk of the Vagous Pair, impart their Ramifications to the hinder Part of it.*

ϖ. *The Vertebral Artery bound about by the Vertebral Nerves.*

sss. *Nervous Shoots covering the Fore-Region of the Heart.*

TTT. *Nervous Shoots and Fibres distributed to the hinder Part of it.*

Θ. *The lower fold, properly called the Intercostal or Thoracic; into which, besides the Intercostal Nerve, four Vertebrals are inserted, of which, the uppermost in its Descent, winds about the Vertebral Artery.*

I. *The Intercostal Nerve descending through the Cavity of the Breast, near the Roots of the Ribs, where in its whole Progress, it admits a Branch from the particular middle Vertebres.*

H. *A Nerve of the Tenth Pair, consisting in its Original, of many Fibres, and springing forth between the first and second Vertebre, where*

where it presently sends forth two nervous Processes bb. *into the upper Fold of the Intercostal Nerve.*

x. *A Branch of the same, which being united to a little Twig of the ninth Pair, terminates in the Muscle Sternothyroides, immediately resting upon the Aspera Arteria.*

20. *A small Twig reversed into the hinder Muscles of the Neck.*

21. *A small Twig into the Pathetic Spinal Nerve.*

x. *Shoots from the principal Branch of the same Nerve into the Sternothyroides Muscle.*

I. *The Original of the first Vertebral Nerve, which in this as in all other Vertebral Nerves, consists of many Fibres, of which, the one Bunch proceeds from the upper, the other from the lower Brim of the Spinal Marrow, when they are met close into the same Trunk, which is presently shattered into Nerves distributed several ways.*

θ. *A small Sprig from this Nerve into a Branch of the tenth Pair.*

θ. *Another small Sprig into the Pathetic Spinal.*

c. *A signal Branch sent upwards to the Muscles of the Neck and Ears.*

T. *A small Sprig from the bowed Nerve to the Fore-muscles of the Neck.*

7. *A Nerve from this Pair to the first Brachial Nerve, from whence the Nerve of the Diaphragma takes its uppermost Root.*

M. *The Original of the second Vertebral Nerve, from which the uppermost Brachial Branch proceeds, and into which the Nerve of the Diaphragma is first radicated. This Brachial Nerve, in four-footed Beasts, rises near the fourth and fifth Vertebre, and so the Root of the Diaphragma lies beneath.*

V. *The Vertebral Branch designed to the Arm.*

Y. *The Nerve of the Diaphragma, to the Root of which, the Sprig δ. from the Cervical Fold, joyns it self, and a little lower, from the same Fold, two other Branches εε. extend themselves to the Trunk of it. This Communication is only proper to Men.*

φ. *The other Root of the Diaphragma from the second and third Brachial Nerve.*

χ. *The lower Trunk of the Nerve of the Diaphragma, removed out of its place, which in its natural Situation, crossing the Cavity of the Breast without any Communication, runs directly to the Diaphragma; where spreading into three Sprigs, it is inserted into the Musculous Part of it.*

ϟϟ. *The rest of the Brachial Nerves.*

ωω. *The Originals of the Brachial Nerves.*

22. *The farthest Original of the Spinal Nerve that comes to the Vagous Pair.*

23. *The beginning Trunk of the same Nerve, which in its whole assent, running through the side of the Spinal Pith, passes through the middle Originals of the Vertebral Nerves, and from the Stalk of the Pith, receives its Fibres.*

24. *The descending Trunk of the same Nerve, which parting from the Vagous Pair, is reflexed outward, and after Communication with the Nerves of the Ninth and Tenth Pair, terminates altogether in the Muscles of the Scapula.*

25. *The lower Process of the same Nerve.*

The

The EXPLANATION of the *Thirteenth* TABLE
In *Fol.* 419.

This Table ſhews the lower Ramifications of the Vagous and Intercoſtal Pair diſtributed to the Ventricle and the Bowels of the whole *Abdomen*: as alſo the Originals of the Vertebral Nerves, which lye oppoſite to the former, and are inoculated into ſome of them.

A. *The lower Stomachic branch, which conſiſts of the inner branches of the vagous Pair of each ſide united together, and which being ſpread over the Bottom of the Stomach, diſpeirſes it's ſhoots and rivolets all along every way.*

BB. *The upper Stomachic branch which conſiſts of the External branches of the vagous Pair united together, and creeps through the upper Part of the Ventricle.*

C. *The Coalition of the outer branches.*

D. *A Nervous Fold compos'd of the fibres of each Stomachic Nerve, united together near the Orifice, and as it were woven into a kind of ſmall Net.*

aa. *The Extremities of each Stomachic Nerve, which there meet the Hepatic Nerves and communicate with them.*

EE. *The Intercoſtal Nerve in each ſide, deſcending near the Roots of the Ribs, and all along from the ſeveral Vertebral Nerves ee. receiing a Branch.*

F. *A Branch proceeding from the Intercoſtal Nerve of the left ſide, and ſent toward the Meſenteric Folds.*

G. *The ſame Meſenteric Nerve biforked, ſends a larger Branch to the Fold which is both the Stomachic and Spleenary and a leſſer into the Kidney Fold.*

H. *A Parallel Meſenteric Branch proceeding from the Intercoſtal Nerve of the right ſide, and bending toward the Meſenteric Folds.*

3. *The bigger Branch of this Nerve in like manner biſork'd, runs to the Hepatic Fold, and the leſſer to the Kidney Fold.*

h. *The firſt Meſenteric Fold of the left ſide, which is alſo the Stomachic and Spleenary, from which ſeveral little bundles of Nerves, or numerous Conjugations run ſeveral and ſeveral ways.*

5. *The Meſenteric Kidney Fold of the left ſide, into which beſides the Meſenteric Sprig, ββ. two other Nerves are immediately inſerted from the Intercoſtal Nerve.*

γγγ. *From this Fold ſeated near the Capſula of the Gall, ſeveral Nerves and Fibres, are ſent to the Kidneys.*

δδ. *The Nerves and Fibres by means of which this Fold chiefly communicates with the Meſenteric Fold.*

ζ. *The firſt little bundle of Nerves tending from the former Fold* h. *to the Spleen, where being arriv'd, it turns back certain Fibres to the bottom of the Ventricle.*

η. *The ſecond Conjugation of Nerves, from the foreſaid Fold to the bottom of the Stomach, whoſe Fibres communicate with the ſmall Sprigs of the lower Stomachic Nerve.*

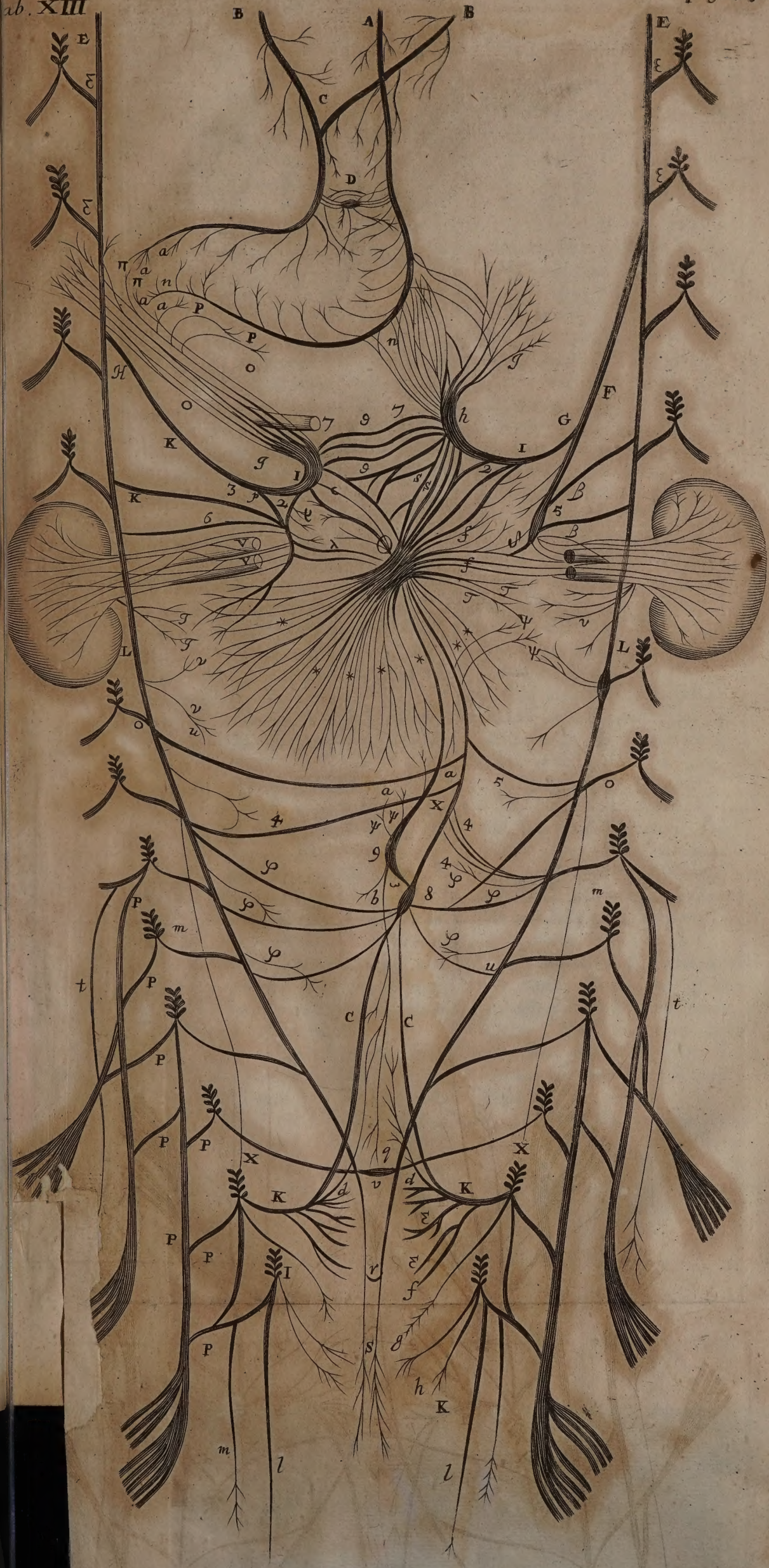
θ. *The third Conjugation of Nerves between this Fold and the Hepatic adjoyning.*

ι *The fourth Aſſemblage of Nerves between this and the largeſt Meſenteric Fold.*

6. *The Kidney Meſenteric Fold, into which as in its Parallel, beſides the Meſenteric branch.*

KK. *Two Nerves are produc'd from the Intercoſtal Nerve.*

λ. *The*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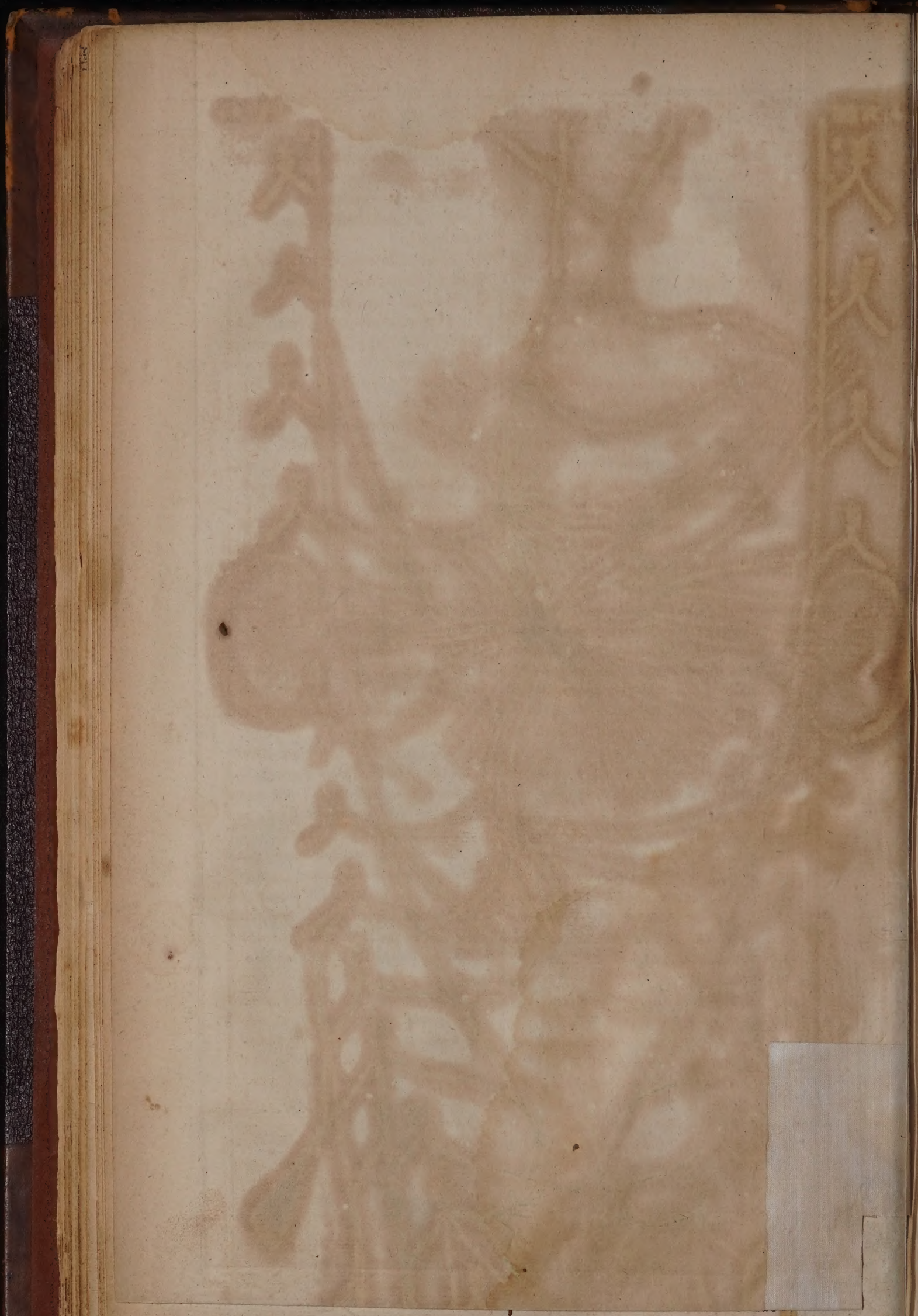

λ. *The Nerves and Fibres between this Fold and the largeſt of the Meſentery.*

μ *A ſignal Branch between this Fold, and the adjoyning Hepatic.*

γ *A ſignal Aſſemblage of Nerves and Fibres from this Fold to the Kidneys, which climb the Emulgent Veſſels, and variouſly bind them.*

77. *The upper Meſenteric Fold of the right ſide, called the Hepatic.*

oo. *A numerous Aſſemblage of Nerves from this Fold to the Liver and Gall-bladder, from whence ſeveral Sprigs are diſtributed to the* Pylorus *and Sweetbread. Theſe Nerves and Fibres aſcending toward the Liver, cover the Hepatic Artery with a kind of Net, and almoſt hide its Trunk. Theſe Sprigs meet together with the tops of the Stomachic Nerves* aa.

π. *Sprigs diſtributed about the* Pylorus.

ϱϱ *Other Sprigs diſpeirs'd into the Sweet-bread.*

cc. *The Nerves extended between the Fold and the largeſt of the Meſentery,*

O. *The largeſt Meſenteric Fold, from which a vaſt Aſſemblage of Nerves* **. *ariſing under the large Kernel of the Meſentery, is diſpeirs'd every way into ſeveral ſhoots and branches, and diſtributed to all the Inteſtines beſides the right Gut. Nerves and Fibres extended every way reſt all along upon the Arteries and Veins, and bind and tye them after various manners.*

TT. *Nervous ſhoots from this Fold into the Female Teſticles, or Uterine Kernels, which meet the branches of the Vertebral Nerves of the twentieth and one and twentieth Pair ſent to the ſame Parts, and are knit together.*

VV. *The Vertebral branches into the Female Stones.*

8. *The lowermoſt Fold of the Meſentery, ſeated much beneath the former, and having for their Original three Nerves on each ſide, ariſing ſomewhat lower from the Intercoſtals.*

φφφ. *Three Nerves on each ſide ſent from the* Intercoſtal *Nerve to the lowermoſt Meſenteric Fold.*

χχ. *A Nerve extended directly from that Fold to the largeſt Meſenteric Fold, which in its paſſage receives certain Branches from the Intercoſtal Nerve on each ſide,* viz. 4. 4. 5. 5. 5. *and ſends it ſelf two Sprigs to the Female Teſticles.*

ϟϟ *Two Nerves from the foreſaid Nerve to the Female Teſticles.*

9. *Another little Fold ſomewhat above this lowermoſt.*

ω. *A nervous Proceſs extended from the foreſaid lowermoſt Fold into the adjoyning ſmall one.*

a. *A ſignal Nerve from the leaſt Fold* 9. *carry'd to the largeſt Fold of the Meſentery, which during its whole aſcent, ſtretches it ſelf under the right Gut and part of the Colon, and furniſhes them with numerous ſhoots.*

bb. *The other Branch ſent downwards from the ſame Fold, which ſtretches it ſelf under the lower Part of the ſaid right Gut, and affords it numerous ſhoots.*

cc. *Two Nerves ſent downward from the lowermoſt Meſenteric Fold* 8. *which being diſmiſſed about the lowermoſt Cavity of the Belly into the Baſin, in that place ſink under the two Folds* kk. viz. *one ſeated in each ſide.*

KK. *The double Folds ſeated within the Baſin, the Nerves of which are aſſign'd for the Excretions of Urine, Dung and Seed, and ſo they ſend forth the Nerves* d. d. *toward the lowermoſt Meſenteric Fold.*

dd. *A Nerve which aſcending from the foreſaid Fold on each ſide, near the ſides of the right Gut, inſerts ſeveral ſhoots into it: with which being double the other Nerve* b. e. *deſcending from the ſmalleſt Fold, meets.*

ee. *The Nerves from the same Fold to the Womb.*
f. *A Nerve from the same Fold to the Blader.*
g. *A Nerve to the Prostates.*
h. *A Nerve from the Root of the twenty eighth Vertebral Pair to the Muscle of the* Podex.
i. *The twenty ninth Vertebral Pair, from whence,*
k. *A Nerve to the Sphincter and the rest of the Muscles of the* Podex.
ll. *A signal Nerve on both sides from the same Pair to the Yard.*
m. *Another shorter Branch to the Muscles of the Yard.*
LL. *The Intercostal Nerve below the Kidneys.*
m. *A little Nerve from the Vertebral Branch to the Cremaster Muscle of the Testicle in Men.*
n. *The* 21. *Vertebral Pair, the Original of which lyes hid near the Kidneys. From this Nerve several shoots are sent on both sides to the Female Testicles, which meet with other Mesenteric Sprigs distributed to the same Part.*
o. *A Nerve from the* 22. *Vertebral Pair, from whence also certain Sprigs to the Female Stones.*
pppp. *Nerves design'd for the Thigh, of which those that rise above, in their descent receive Branches from those that rise beneath.*
q. *The Intercostal Nerves bending each to other near the beginning of the Holy bone, communicating by the transvers Proces* r.
rr. *The other transvers Proces within the Curvature of the* Os Sacrum *connecting the two Intercostal Nerves.*
s. *Both Intercostal Nerves terminate into minute Fibres, which Fibres are distributed into the Sphincter of the* Podex.
t. *A Nerve from the* 24. *Vertebral Pair, which is carry'd to the Kernels of the Groin.*
vvv. *Shoots on each side sent from the Intercostal Nerves to the body of the Ureter.*
X. *A Nerve design'd to the Testicle and Cremaster Muscle; cut off where it goes forth from the* Abdomen.

The EXPLANATION of the *Fourteenth* TABLE

In *Fol.* 457.

FIGURE I.

The Exterior Parts of the Eye.

AAAA. THE *Skin turn'd back,*
BB. *The bigger Muscle of the Orbicular Eye-lid.*
C. *The Tendon of the same in the wider corner of the Eye.*
DD. *The lesser Muscles of the Eye-lyds.*
EE. *The Brows of the Eye-lids.*
G.H. *The upper and lower Eye-lid.*
I. *The larger Corner.*
K. *The lesser Corner.*
L. *The Conjunctive Tunicle.*
M. *The Corneous Tunicle.*

FIGURE II.

The Muscles and Nerves of the Eye.

AAAA. *The* Cranium *cut open.*
BB. *A portion of the dissected Brain.*
CC. *The Cerebel.*
D. *The meeting of the Optic Nerves.*
EE. *Their Progress to both Eyes.*
GG. *The first Muscle of the Eye, called the* Attollent.
H. *The second Muscle of the left Eye, called the* Depressor.

II. *The*

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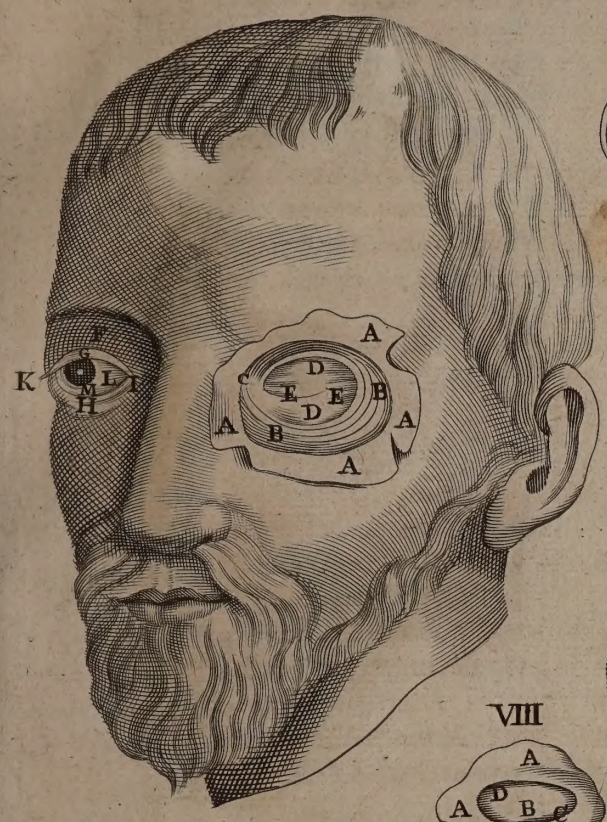

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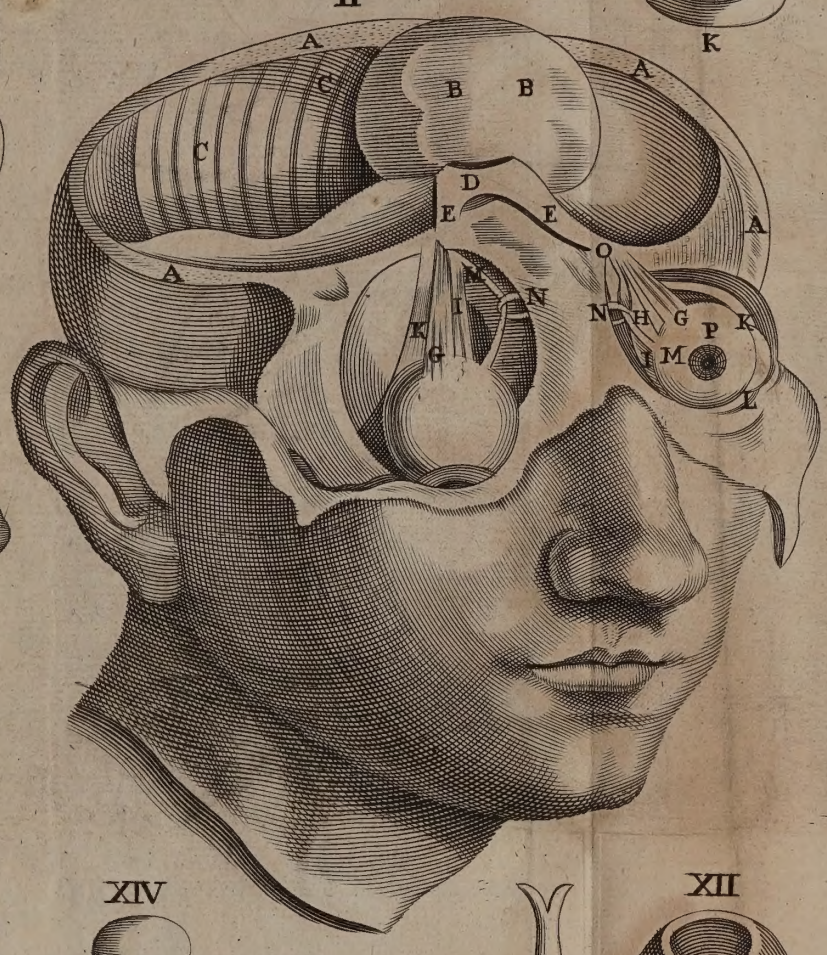

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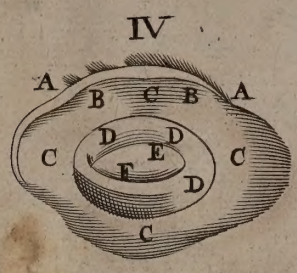

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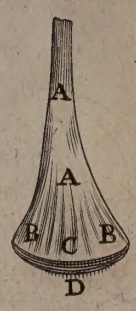

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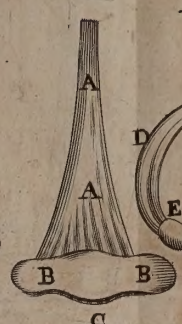

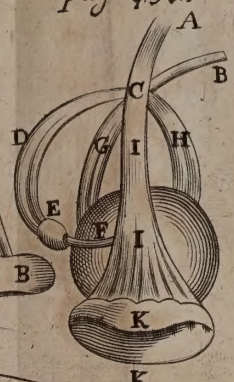

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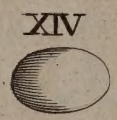

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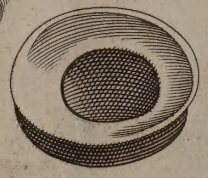

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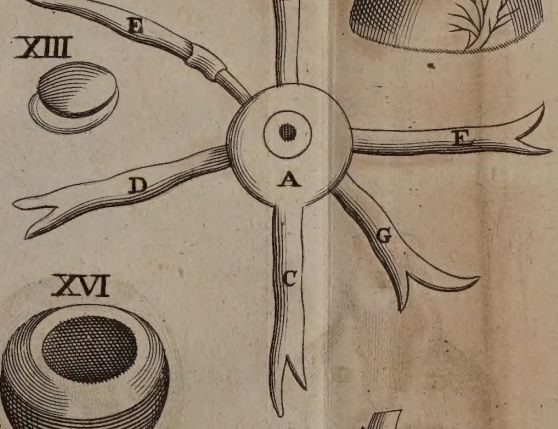

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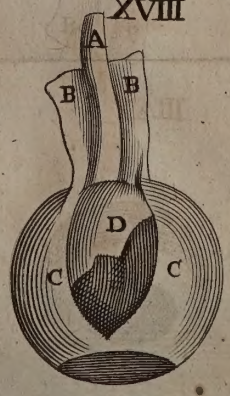

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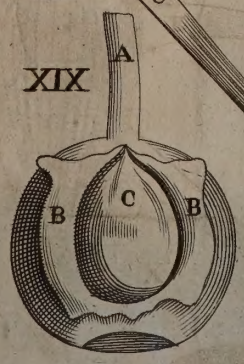

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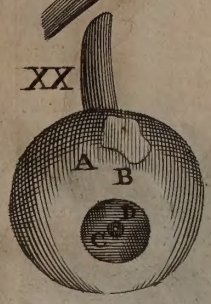

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IIIX
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IIVX

II. *The ſtreight inner Muſcles, or drawers to, in each Eye.*
KK. *The external ſtreight Muſcles or drawers from each Eye.*
L. *The fifth Muſcle of the left Eye, or the External Oblique.*
MM. *The ſixth Muſcle or Internal Oblique, the Tendon of which paſſes through the* Trochlia, N.
O. *The Optic Nerve of the right Eye.*
P. *The Corneous Tunicle in the midſt of which is the Apple.*

FIGURE III.

AA. *The* Cranium *reſected.*
BB. *The Cerebel.*
CCCC. *The* Dura Mater.
D. *A portion of the diſſected Brain.*
EE. *The Sprig of the Optics.*
F. *Their concourſe.*
GG. *Their ſeparation.*
H. *The general Original of the Muſcles.*
II. *The Muſcle of the Eyelid in its place.*
K. *The ſtreight Muſcle drawing the Eye outward.*
L. *The ſtreight Muſcle moving the Eye upward.*
M. *The third right Muſcle moving the Eye-downward.*
N. *The laſt right Muſcle drawing the Eye to the inner Parts.*
OO. *Branches of the Motory Nerve inſerted into the Muſcles.*
PP. *The Globeous Body of the Eye it ſelf prominent under the Muſcle of the Eye-lid.*
Q. *The upper Eye-lid with its Hairs.*
R. *The Bone broken off.*
S. *The Body of the left Eye.*
T. *The Muſcle of the upper Eye-lid, out of its place turn'd back.*

FIGURE IV.

The Eye-brow and Eye-lids.

AA. *The hairy Eye-brow.*
BB. *The fat of the Eye-brow.*
CCCC. *The inner ſuperficies of the Eye brows.*
DDD. *The Griſtle of the Eye-brow.*
E. *The upper edging of Hair.*
F. *The lower edging of Hair.*

FIGURE V.

AA. *The Muſcle of the upper Eye-lid in it's place.*
BB. *The Griſtle of the Eye-brow.*
C. *The place of the Eye-lid cut off.*
D. *The hairy edging of the upper Eye-brow.*

FIGUR VI.

AA. *The Muſcle of the upper Eye-lid.*
BB. *The Griſtle of the ſame Eye-brow.*
C. *The Hairs.*

FIGURE VII.

A. *The Nerve of Optic.*
B. *The Motory Nerve.*
C. *The riſe of all the Muſcles.*
D. *The Trochlear Muſcle.*
E. *The Trochlea or Wheel.*
F. *The ſtring of the Trochlear Muſcle.*
G. *The Internal ſtreight Muſcle.*
H. *The External ſtreight Muſcle.*
I. *The Muſcle of the upper Eye-lid.*
KK. *The remainder of the Eye-lids cut off.*
L. *The hairy Edgings.*

FIGURE VIII.

AAA. *The Griſtle of the Eye-lids taken out.*
B. *The Hairs of the upper Eye-brow.*
C. *The Hairs of the lower Eye-brow.*

FIGURE IX.

A. *The Corneous Tunicle, with the tranſparent Apple.*
B. *The ſtreight Muſcle* Attollent.
C. *The ſtreight Muſcle depreſſing.*
D. *The inner Muſcle bringing to.*
E. *The External Muſcle drawing from.*

F. *The inner Oblique, or Trochlear.*
G. *The outter Oblique, or lower.*

FIGURE X.

A. *The Optic Nerve.*
B. *The ſeventh Muſcle proper to many Brutes ſurrounding the Eye.*
CCCC. *The ſtreight Muſcles.*
D. *The Trochlear Muſcle.*
E. *The lower Oblique Muſcle.*

FIGURE XI.

A. *The Optic Nerve.*
B. *The Original of the Muſcles.*
C. *The ſtreight lateral Muſcle.*
D. *The upper ſtreight Muſcle.*
E. *The other ſtreight Muſcle.*
FF. *The Fat of the Eye hiding the Muſcles and the Optic Nerve.*
G. *Part of the Skin of the upper Eye-lid cut off.*
HH. *The Sclerotic Tunicle of the Eye.*
I. *The Corneous Tunicle.*
K. *The Apple of the Eye.*
L. *The Hair of the lower Eye-brow.*
MM. *The lower Eye-brow.*

FIGURE XII.

The Annate Tunicle ſeparated and out of place, furniſhed with ſeveral minute Veins and Arteries.

FIGURE XIII.

The Chriſtalline Tunicle.

FIGURE XIV.

The Chryſtalline Humour and its Figure.

FIGURE XV.

The Watry Humour.

FIGURE XVI.

The Vitreous Humour receiving the Chryſtalline in the middle.

FIGURE XVII.

A. *The Optic Nerve.*
BB. *The Choroides Tunicle laid bare from the Sclerotic.*
CCCC. *Veins depreſſed through the Sclerotic.*
DD. *The Sclerotic inverted.*
E. *The Rupture of the Sclerotic.*

FIGURE XVIII.

A. *The Optic Nerve.*
BB. *The Dura Mater ſurrounding the Optic.*
CC. *The Sclerotic opened, ſhewing the Nerves through the Fiſſure.*

FIGURE XIX.

A. *The Optic Nerve.*
BB. *The Uveous folded back, and partly ſeparated from the Net-like.*
C. *Part of the Net-like ſeparated from the Uveous.*

FIGURE XX.

A. *The Net of the Tunicle bare.*
B. *The Conjunctive Tunicle, or the White of the Eye.*
C. *The Corneous.*
D. *The Apple of the Eye.*

The

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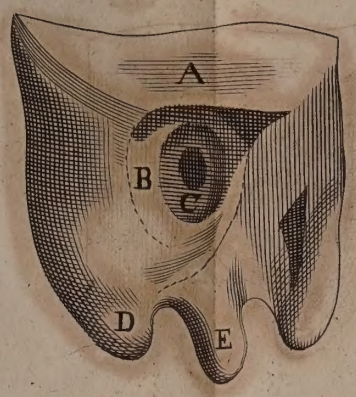

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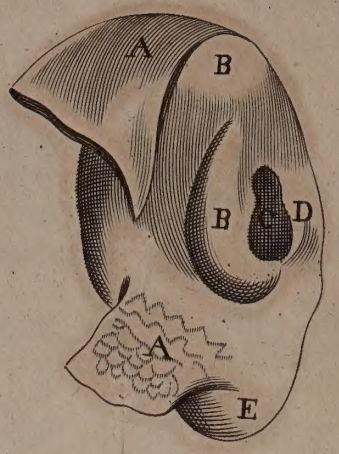

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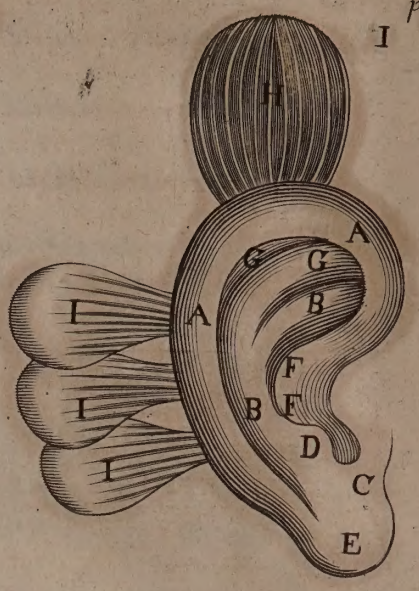

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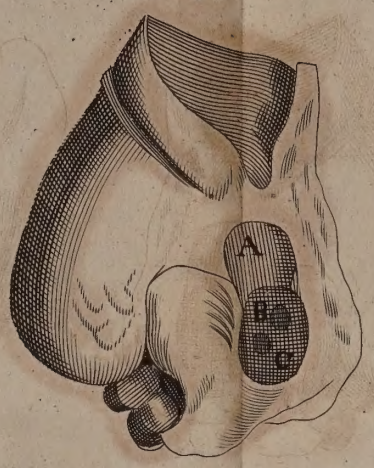

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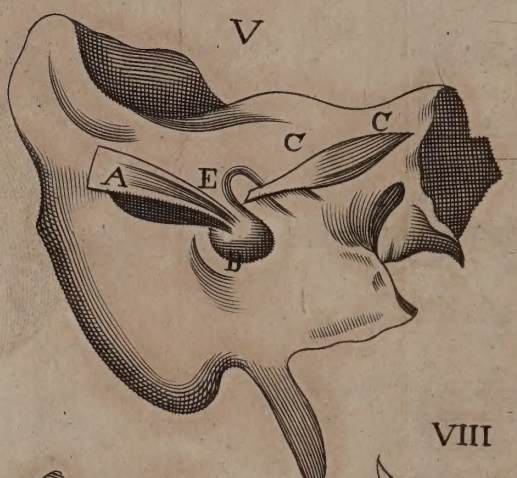

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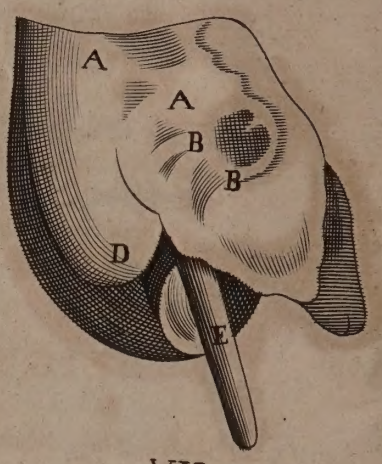

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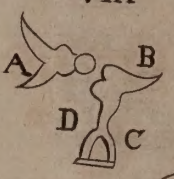

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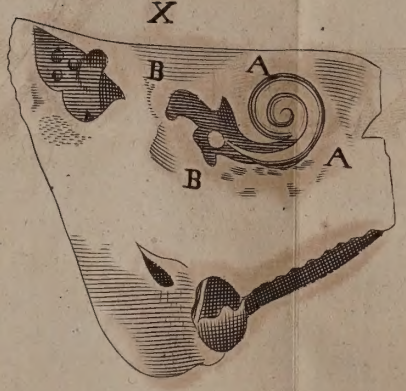

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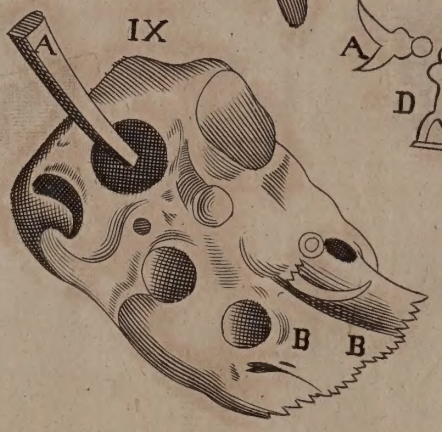

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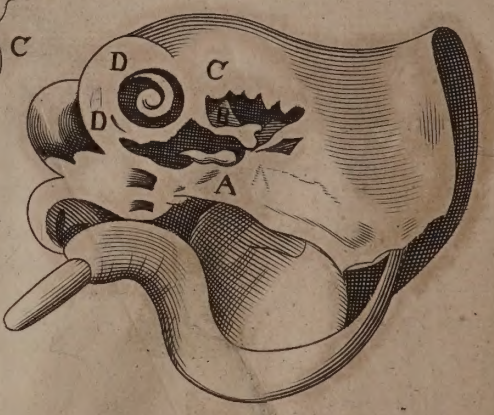

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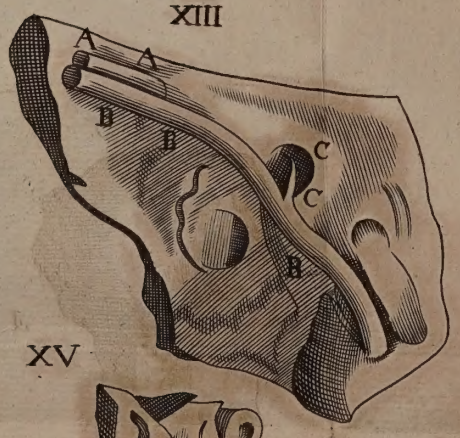

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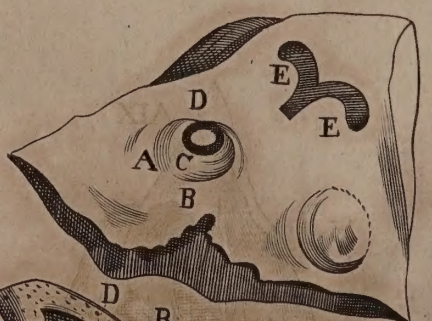

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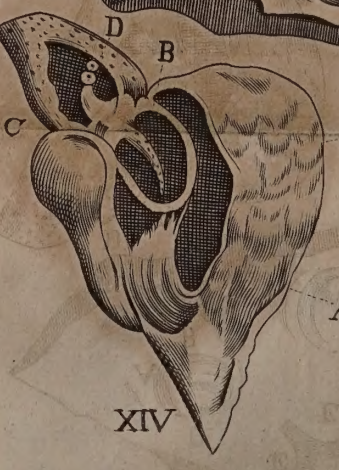

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XVI

The EXPLANATION of the *Fifteenth* TABLE, In *Folio* 469.

Shewing the Parts of the Ear, especially the Inner Parts.

FIGURE I.

The External Ear whole with the Muscles and Concavities.

AA. THE *Helix of the Ear.*
BB. *The Anthelix.*
C. *The Tragus or Bunching of the Ear.*
D. *The Anti-tragus.*
E. *The Lobe of the outer Ear.*
FF. *The Shell or Hollow of the outer Ear.*
GG. *The Nameless Cavity between the Helix's.*
H. *The Muscle moving the Ear directly upward.*
III. *The three-fold Muscle drawing it upwards.*

FIGURE II.

AA. *The Skin with the Membrane drawn upward and downward.*
BB. *The Gristle constituting the Ear.*
C. *The Hole pervious to the Auditory Passage.*
D. *Part of the Ligament of the outer Ear.*
E. *Part of the Lobe of the Ear.*

FIGURE III.

The Fore-part of the Inside Ear.

A. *Part of the Bone of the Temples, containing the Stony Bone.*
B. *The Auditory Passage.*
C. *The Threshold of the Auditory Passage, or Bee-hive.*
D. *The Mammi-form Process.*
E. *The Style-resembling Process torn off.*

FIGURE IV.

A. *A Portion of the Auditory Passage.*
BB. *The Membrane of the Drum.*
C. *The little Foot of the Hammer transparent through the Menbrane.*
D. *The Teat-like Process.*
E. *The Bodkin-like Process.*

FIGURE V.

The Muscles of the Inside Ear.

A. *The Muscle moving the Membrane with the Hammer outward.*
B. *The Membrane of the Drum.*
CC. *The Muscle moving the Membrane with the Hammer inward.*
E. *The Head of the Hammer.*

FIGURE VI.

A. *Part of the Auditory Passage.*
B C. *The Cavity of the Drum, wherein.*
B. *The Oval Hole, conspicuous when the Stirrup is removed.*
C. *The Round Hole.*

FIGURE VII.

The Stony Bone, with the small Bones of the Tympanum, in Place.

A. *The small Hammer.*
B. *The small Bone called the Anvil.*
C. *The upper Part of the Stirrup.*

DD. *The Windings of the Cochlea discovered according to their natural Bigness.*

FIGURE VIII.

Four little Bones out of place.

A. *The little Hammer, with its two Processes.*
B. *The Anvil applied to the Hammer.*
C. *The Stirrup.*
D. *The Orbicular Bone fastned with the Ligament of the Stirrup.*

FIGURE IX.

The lower Face of the Bone of the Temples.

A. *The Goos-quills transmitted into the Auditory Passage, through the Passage which leads to the Palate.*
BB. *Shews the same Passage next at Hand, though broken in Part.*

FIGURE X.

AA. *The Hollowness of the Cochlea, the broader Part of which, runs to the Labyrinth.*
BB. *The Hollowness of the Labirinth, wherein the Oval Hole appears, by reason of the Bone dissected from the side. Four other Holes opening themselves in Circles, are shadowed with Black. The fifth, in the Extream largest Turning of the Cochlea, is broken,*

FIGURE XI.

AA. *The first Hole of the Bones of the Temples, into which the Auditory Nerve is admitted.*
BB. *The Stony Process of the Bone of the Temples, in which the demonstrated Cavities are contained.*

FIGURE XII.

AB.CD. *The end of the passage discover'd.*

into which the Auditory Nerve enters, the Bone being fil'd away.
B. *The Hollowness wherein the softer part of the Auditory Nerve, rests at the Center of the* Chochlea.
CA. *An Apophysis between each Portion of the Nerve, prominent like a Bridge.*
EE. *The Footsteps of two Circles, tending to the Labyrinth.*

FIGURE XIII.

A. *Part of the Bone of the Temples in which the* Tympanum *being removed, together with the passage receiving the Auditory Nerve, appears.*
AA. *The softer part of the Auditory Nerve.*
BBB. *The harder part of the Auditory Nerve, obliquely descending under the Drum, thicker at the Exit.*
CC. *A Small Nerve from the fourth Pair, joyning it self to the descending harder Portion of the Auditory Nerve.*

FIGURE XIV.

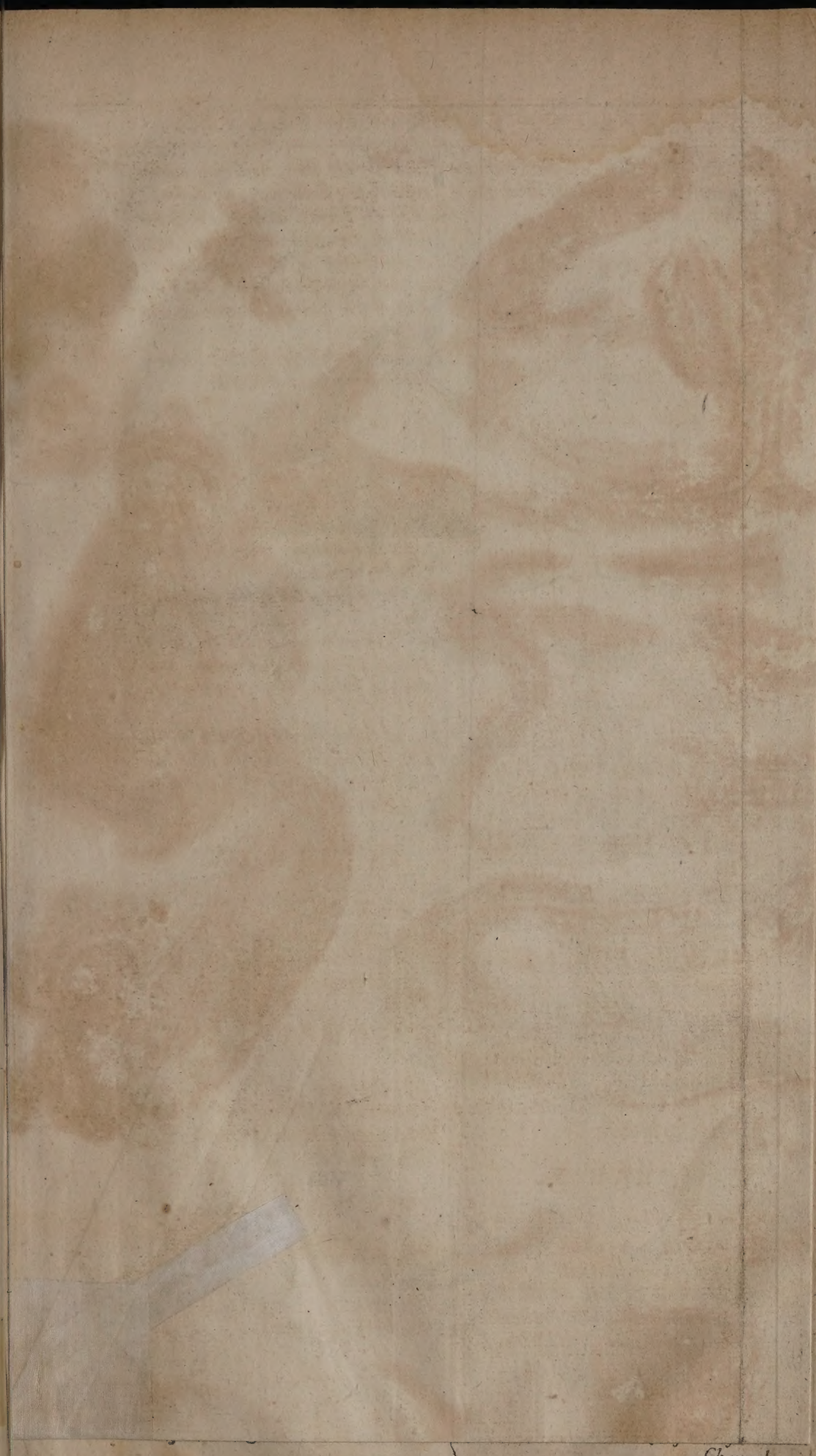
AA. *The Shell.*
B. *The Drum.*
C. *The Hammer.*
D. *The Stirrup.*

FIGURE XV.

E. *The Stirrup.*
F. *The orbicular Bone fasten'd with the Ligament of the Stirrup.*
G. *The Oval hole.*

FIGURE XVI.

H. *The Hammer.*
I. *The Staple.*
K. *The Stirrup.*
L. *The Orbicular Bone.*



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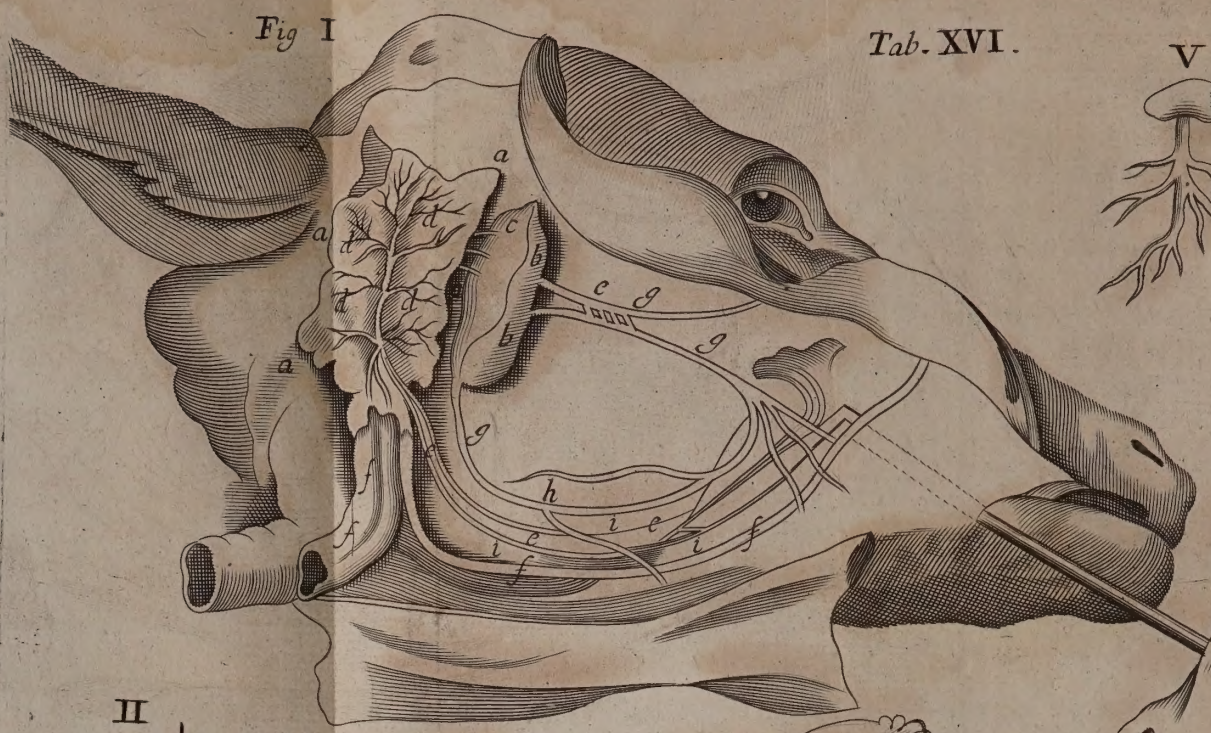

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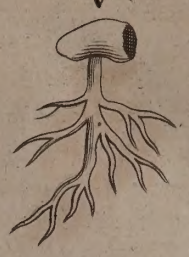

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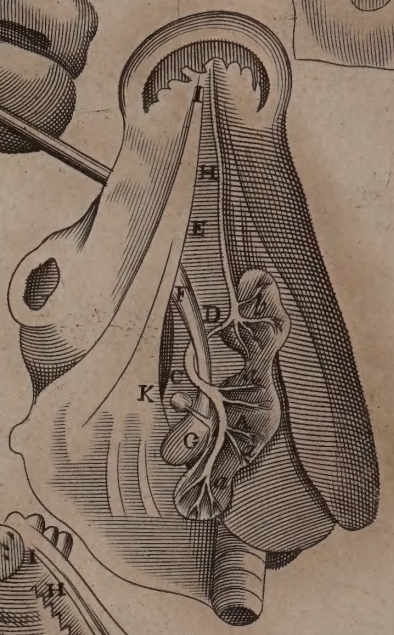

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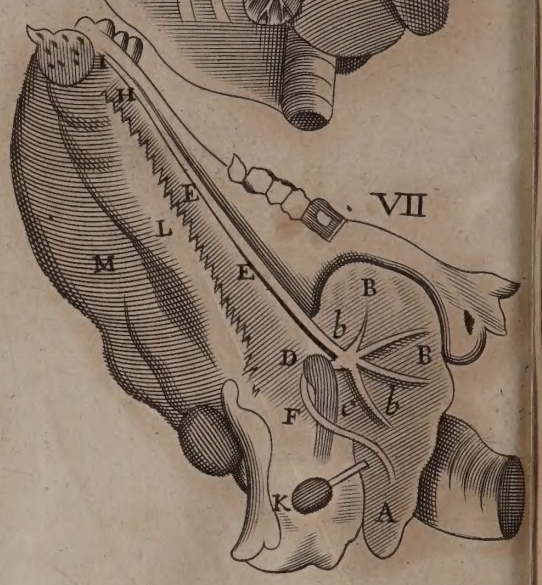

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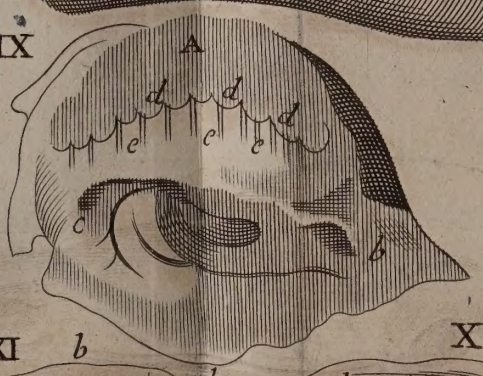

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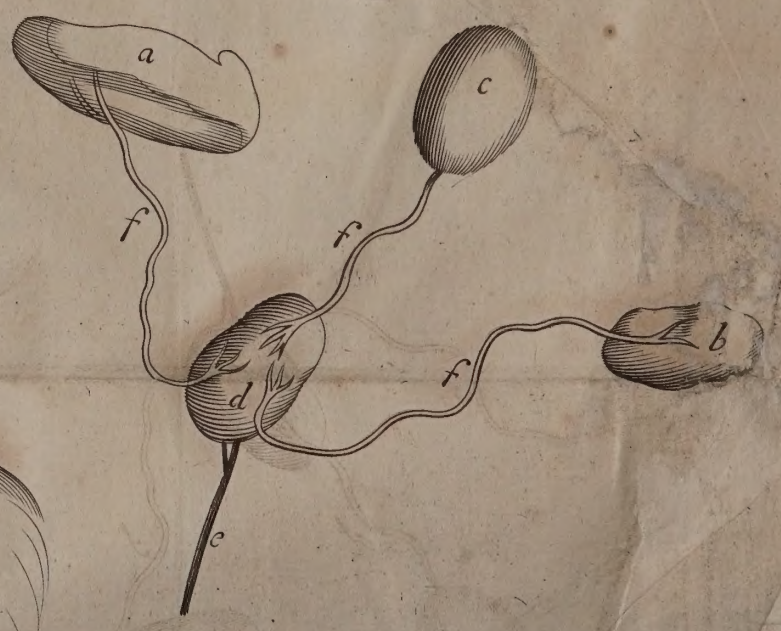

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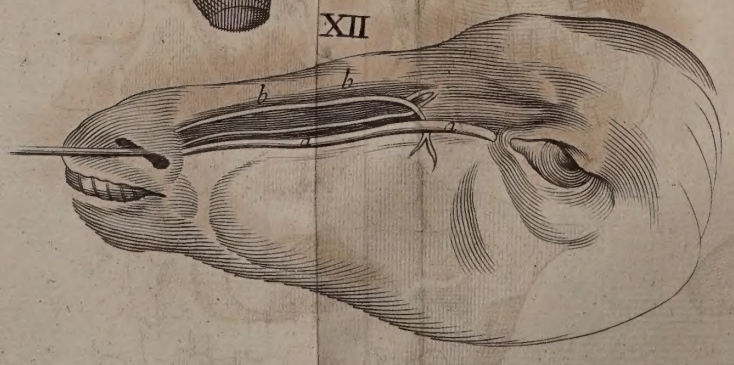

The EXPLANATION of the *Sixteenth* TABLE, In *Folio* 488.

Shewing the Salavary Channels, and the Lymphatic Channels of the Eyes in a Calves Head, as they are acurately delineated by *N. Stenonis* and *Wharton*.

FIGURE I.

aaaa. THE Parotis *conglomerated.*
bb. *The* Parotis *conglobated.*
e. *The Lymphatic Vessel tending downward from the conglobated* Parotis.
dddd. *The Roots of the outer Salival Channel.*
eee. *The Trunk of the Salival Channel.*
fff. *The outermost Branches of the Jugular Vein.*
ggg. *The Nerves which are between the Kernel and the Head, so are they knit one to another, as in* H.
II. *Little strings of the Nerve accompanying the Salival Channel.*

FIGURE II.

aa. *The Orifices of the Vessels proceeding from the lower Kernel of the Cheeks into some of which a Bristle may be thrust.*
b. *The opening of the outermost Salival Channel in the uppermost and Extream Part of the little Teats. The other points mark out the other holes, through which the viscous Humor upon squeezing issues forth.*

FIGURE III.

aa. *The Kernel under the Tongue.*
bb. *The Vessels belonging to it.*
cc. *The Orifices of the Vessels for excretion.*
d. *A hollowness observ'd at the side of the Tongue.*

FIGURE IV.

A. *The holes of the Palate through which the slimy Humor is squeezed out.*
bb. *The Tonsils.*

FIGURE V.

One Vessel among the rest of those that proceed from the Kernel in the lower Part of the Cheeks.

FIGURE VI.

A. *The hinder Part of the* Maxillary *Kernel.*
aa. *The hindermost Roots of the Salival Channel.*
C. *The hindermost Trunk of the same Channel, ascending the Tendon of the double belly'd Muscle.*
DD. *The return of it and uniting with the foremost Channel.*
E. *The common Trunk of the Salival Channel.*
F. G. *The double belly'd Muscle.*
H. *The Progress of the said Trunk to the Fore-teeth, of the lower Jaw.*
I. *The Opening of the Channel under the Tongue.*
K. *The round Kernel next to the* Maxillary.

FIGURE. VII.

A. *The hinder Part of the* Maxillary *Glandule.*
BB. *The former Part of the same, with the foremost Roots of the Spittle-Channel.*
C. *The hinder Trunk of the same Channel*

Channel ascending a Tendon of the double-belly'd Muscle.

D. *The return of the same and Union with the foremost Channel.*

EE. *The common Trunk of the Salival Channel.*

F.G. *The double-Muscl'd Muscle.*

H. *The Progress of the Trunk toward the Fore-teeth of the lower Jaw.*

I. *The Salival Channel open'd under the Tongue.*

K. *A round little Kernel nextto the Maxillary.*

L. *A row of Asperities under the side of the Tongue.*

M. *The Tongue out of its place.*

FIGURE VIII.

The Conglobated Kernels.

a. *The Conglobated* Parotis.

b. *The Conglobated Kernel next the lower* Maxillary *Kernel.*

c. *Another Conglobated Kernel seated above the Chaps.*

d. *The common Kernel.*

e. *The* Lymphatic *Vessel tending to the Confines of the* Jugulary *and* Maxillary *Kernel.*

fff. *Three* Lymphatic *Vessels, carry'd from the three Glandules* a. b. c. *to the common Glandule* d.

FIGURE IX.

The Left Eye of a Calf.

A. *The upper nameless Glandule of the Eye.*

b. *The larger Corner of the Eye.*

c. *The lesser Corner of the Eyes.*

ddd. *The Lobes into which the foremost Border of the Kernels is divided through the* Lymphatic *spaces of which* eee. *They make their Exit.*

FIGURE X.

A. *The inner superficies of the Eye-lid.*

bbb. *The Nameless Kernel which together with the small Vessels* ccc. *appears through the slender Tunicle of the Eye-lid.*

dd. *The Orifices of the* Lachrymal *Vessels.*

FIGURE XI.

A. *The* Lachrymal *Kernel seated in the inner Corner.*

B. *The Gristle proceeding from the Kernel it self.*

bbb. *The gristly Border.*

cc. *The Membrane.*

dd. *Two Entrances, one of each side the Gristle.*

FIGURE XII.

aa. *The continuation of the* Lachrymal *points to the Extremities of the Nostrils.*

bb. *The Vessel for excretion proper to the Nostrils.*

The

ANATOMY

BOOK I.

Of the loweſt Cavity.

The Preamble.

I Am undertaking to write a Book of Anatomy; but am doubtful whether I ſhould term it the Art and Exerciſe of Phyſicians, or of Philoſophers. For though formerly it was firſt inſtituted for their ſakes; yet now theſe are ſo much taken up with it, that it can ſcarce be determined, to which Faculty it is more obliged, or to which it is of nearer Affinity: Since in this our Age both the one and the other are as induſtrious in this Affair, as if the welfare of each Faculty lay in Anatomy, and as if both borrowed all their Light from it, as from another Sun; ſo that they who are deſtitute of Skill in this one Art, are reckoned to walk in darkeneſs and to know nothing in a manner: Since ſeveral others alſo, who are of neither Faculty, nor indeed profeſſedly of any, are ſo ſollicitous about the knowledge of Man's Body, that may ſtrive how they may bring Anatomy to greater perfection; and moſt of theſe men are deſirous not only to equalize others in this Exerciſe, but to ſignalize themſelves above the reſt. So that Anatomy, which formerly was undertaken for the ſake of Phyſick, appears now to be the common Practice of all men, and as it were the Eye of all ſolid Knowledge whatever. To whoſe further advancement, ſince I alſo would contribute my Talent, when I have examined firſt what Anatomy is, and what its Subject, I ſhall in ſuccinct order take a view of all the Parts of the humane Body.

CHAP. I.

Of Anatomy, and Man's Body, its Diviſion and Parts in general.

Definition of Anatomy

I. *ANatomy is an Art which teaches the Artificial diſſection of the Parts of the Body of Man, that what things in them can be known by Senſe, may truly appear.*

Subject.

The primary ſubject of Anatomy is the Body of Man, partly becauſe it is the perfectest; partly becauſe the knowledge of a Man's ſelf is very neceſſary, a great ſhare whereof conſiſts in the knowledge of his own Body. Beſides, Anatomical exerciſes are very neceſſary for Phyſicians, and were chiefly inſtituted for their ſakes, whoſe Studies are directed to the cure of Diſeaſes only in humane Bodies, and not to the cure of Brutes, as being unworthy of their noble Speculations, and therefore left to Farriers and other Plebeians. So that in this regard the Artificial Diſſection of humane Bodies muſt be preferred before the Diſſection of any Brute whatever; ſince Phyſicians may this way far better attain the perfect knowledge of the ſubject of their Art, than if they ſhould ſearch the Bodies of Brutes. In the mean time, however, becauſe humane bodies cannot always conveniently be had, neither will Law nor Piety at any time allow the cutting of them up alive, yet nevertheleſs it is neceſſary that we ſhould get the perfect knowledge, of the ſite, connexion, ſhape, uſe, *&c.* of the Parts by many Diſſections and Inſpections; for which purpoſe men uſe, in defect of humane Bodies, to diſſect ſeveral Brutes, ſometimes alive, but uſually dead, eſpecially ſuch, whoſe Inwards and moſt of their Parts are likeſt in form, ſite, and uſe to the humane body; that by the knowledge of them the parts of a humane body may the eaſilier be known, when afterwards they are once or twice ſhown in a humane body.

Different conſideration of the Body.

II. *A humane body is conſidered* generally *or* particularly.

Generally.

III. *Conſidered* generally, *or in the whole, the chief differences are obſerved in relation both to the ſhape, ſtature and colour.*

Difference of ſhape.

What the ſhape is in the known World, every one knows, and dayly ſees. But they that have ſeen the Eaſt and Weſt *Indies*, and that have Travelled other ſtrange and remote Countries, deſcribe many uncouth and unknown ſhapes to us. For ſome tell, how they have found Men without heads, whoſe eyes were in their breaſts: Others, men with ſquare heads: Others, men all hairy: Others, Salvages, whoſe ſhoulders were higher than their heads; they write, ſuch were found in *Guajana*: Others, men with Tails: And others, men otherwiſe ſhaped.

Difference of Stature.

Difference of ſtature conſiſts herein, that ſome are thick, others ſlender; ſome ſhort, others tall. Upper *France* breeds ſhort and ſlender men, and very few tall people are found there. Northern Countries breed tall and ſtrong men: And the *Germans* come nigh them. *England* and *Holland* breed a middle ſort. Nevertheleſs, ſome very tall people, though few, are found in the Low Countries. Ten years agone at *Utrecht* I ſaw a Maid Seventeen years of Age, ſo tall, that a proper man could ſcarce reach to the top of her head with his fingers ends. Neer *Schoonhoven*, in the Village *Leckerkerck*, a few years agone, there lived a Country fellow, a Fiſher, commonly called *the great Clown*, a very ſtrong man, I have often ſeen him, when he ſtretched out his arm, the talleſt of ordinary men might go under it and not touch it. *Anno* 1665. at *Utrecht*-Fair, in the Month of *July*, I ſaw a very ſtrong man, and very tall, and witty enough, (which is a rarity in ſuch great bodies) above eight feet and an half high, all his Limbs were proportionable, and he was married to a very little woman, whom, when he Travelled, he could without any trouble carry in a Pouch along with him: he was born at *Schoonhoven* of Parents of an ordinary ſize. At the ſame time a Country wench was ſhewn, Eighteen years of age, who was nigh as tall as the ſaid man, her whole body was well ſhaped, but ſhe was of a dull capacity. Yet theſe rare inſtances of a vaſt ſtature which I have ſeen (like unto which *Platerus Obſervat. l.* 3. deſcribes four more) are nothing, compared with ſome, which are deſcribed by Hiſtorians. The body of *Oreſtes*, which by command of the Oracle was dug out of the Earth, is ſaid to have been ſeven Cubits long: which Cubits, according to *Aulus Gellius*, among the *Romans* amounted to twelve

Very tall People.

feet

feet and a quarter. *William Schouten* in his Journal reports, that in the Port, called *Desire*, neer the Straits of *Magellan*, he found men of ten and eleven Cubits. *Fazellus*, *decad.* 1. *lib.* 1. *cap.* 6. mentions several bodies, found in divers places, some of which were seventeen, others eighteen, others twenty, others two and twenty Cubits long, and one of their Teeth weighed five ounces. *Pliny* writes, that in *Crete* a Mountain was broke by an Earthquake, and on that occasion a body of forty seven Cubits was found, which some thought *Orion's*, others *Oetius's*. So likewise *Camerarius* relates divers stories of such Giants, *Meditat. Histor. cent.* 1. *cap.* 82.

Dwarfs. And on the other hand likewise sometimes men are found of a very low stature, *viz.* three or four feet long. We call such *Dwarfs*. Formerly I have seen three or four of them. *Platerus Observ. l.* 3. *in principio*, describes three such, which he saw. *Aristotle lib.* 8. *histor. animal. cap.* 12. writes for a certain truth, that Pigmies dwell about those place, where the *Nile* runs into *Egypt*, and they are such short dwergens, that they are not above an ell high. But this People could never yet be found by the modern Seamen, who have sailed the World over (perhaps, because they could not get with their Ships to that peoples Country) and therefore one might very well question the truth of the story, had not *Aristotle*, who ought to be trusted a great way, writ it. Nevertheless *Spigelius* does not believe *Aristotle*, but reckons his story of the Pigmies a fable, being so perswaded, 1. From the authority of *Strabo*, *lib.* 1. *Geograph.* 2. From the experience of *Francis Alvarez* a Portugueze, who himself Travelled those parts, whereabout *Aristotle* writes, the Pigmies are, namely where the *Nile* runs into *Egypt*; yet he could no where see or find that little Nation, but says, that those parts were inhabited by middle statured people.

Difference of colour. The difference of colour is great, according to the difference of Countries: For in *Europe* and Christendom people are white, in *Æthiopia* and *Brasile* black, in divers parts of *India* tawny, in some places almost red, in others brown, in others whitish.

Particular consideration of the body. **IV.** ***A humane body considered particularly, or according to each part, affords for consideration the neat figure of each part, the most convenient connexion, the admirable structure, the necessary action, and lastly, the great, yet harmonous diversity of all and each function and use.***

Definition of a part. **V.** ***The part of the Body is any bodily Substance joyned to the whole in continuity, having its own proper circumscription, and with other parts making up the whole, is fitted for some function or use.***

What continuity is. This is an exquisite definition.

For *First*, the part of a humane body must be a bodily substance, and such as is joyned to the whole in continuity (*a thing is said to be continued, whose least particles stick one to another in rest*) not in contiguity: For contiguous bodies must of necessity be diverse, and one may be separated from the other without hurting either, both remaining entire. For as Wine contained in a vessel cannot be called a part of the vessel, nor the vessel a part of the wine, because there is no continuity between them two; so likewise blood contained in an Artery, cannot he called a part of the Artery, nor of a humane body, since it is not joyned thereto in any continuity.

Secondly, A part must with others make up the whole; for whatever things are above the complement, are not reckoned parts of one body, but are bodies subsisting by themselves, which often adhere to the whole, that they may be nourished by the whole. Thus a child or mole in the womb are not parts of a womans body, but subsist by themselves, and yet by means of the *placenta uterina* and umbilical vessels, they are joyned to the womb, that they may receive nourishment from it; nevertheless the woman, when she is delivered, remains entire. So likewise *Sarcomata* or fleshy excrescences, and such things, are not reckoned among the parts of a humane body, because they neither make up the complement of the whole, nor are designed for requisite functions and uses, but adhere to the whole, that thereby they may be nourished.

VI. ***Thirdly, A part must be made for some function or use,***

What a function is. **VII.** ***A Function, or Action, is a certain effective motion made by an Organ, through its own proper disposition to it.***

This is either *private*, whereby the parts provide for themselves; or *publick*, whereby the whole is provided for; for instance; The stomach by a private action, or coction, converts the blood brought to it by the Arteries into a substance like it self, and so is nourished: But it performs another action besides, whereby

whereby it provides for the whole Animal, to wit, chylification.

What uſe is.

VIII. ***The uſe of a part is a certain aptitude to ſome proper intention of nature, to wit.***

Such as not only turns to the benefit of the part, whence it proceeds, but alſo reſpects the good of ſome other part, or of the whole. It is doubly diſtinguiſhed from action. *Firſt*, becauſe action is only competible to parts that operate, but uſe is often competible to things that do nothing at all, that is to ſuch as help an acting part, ſo that it may act better. Thus the cuticle acts nothing; but its uſe is to moderate the ſenſe of the skin, to cover it and the extremities of the veſſels, and to defend it from external injuries: Fat acts nothing, it only cheriſhes and moiſtens the parts and makes their motion eaſier: Hair acts nothing; but its uſe is to cover and adorn the head, and to defend it from external cold. *Secondly*, Becauſe action is competible to the whole operating Organ, but uſe to every part of the Organ; for inſtance; The action of a Muſcle is to contract; but the uſe of the Muſculous Membrane is to contain its fibres, and to ſeperate it from other Muſcles; of the Artery, to bring blood to it; as of the nerves, animal ſpirits, to ſupport the fibres of the fleſh. Yet oftentimes uſe, action and function are promiſcouſly uſed by Anatomiſts: And the action of a part, becauſe it tends to ſome end or other, is often called uſe: And alſo uſe, becauſe it excludes not action, is called action. But uſe is of greater latitude then action.

Things that make up the whole.

Hippocrates divided things that make up the whole into *things containing*, *things contained*, and *things that move or have in themſelves the power of motion*. *Galen* calls theſe three things *Solid parts Humors* and *Spirits*. In this diviſion the threefold parts of the body are not comprehended, but only three things, without which a man cannot continue entire, that is, alive. For only the containing or ſolid parts are true parts of the body. Yet theſe parts cannot continue alive, except they be continually nouriſhed by the humors. Not that humors are parts of the body, but the proximate matter, which by coction is changed into the ſubſtance of the parts, into which till they are changed, they cannot be called parts; and when they are changed, they cannot be called humors: for a bone is not blood, and blood is not bone, though the one be bred of the other. The ſame muſt be underſtood of ſpirits, which being made of the ſubtileſt and hotteſt part of the blood, do very much contribute to the nutrition of the body. Therefore though a man cannot continue alive without theſe three, yet it does not follow, that all theſe three muſt neceſſarily be parts of the body. A Vine conſiſts of ſolid woody parts, and a Juyce whereby it is nouriſhed, and yet it is evident, this Juice is no part of the Vine, becauſe if a Vine be unſeaſonably cut, abundance of it runs out, the Vine remaining entire: wherefore a blind man may ſee, that it is no part if the Vine, but only liqour, which by further coction would be turned into a Vine. Thus alſo when there is a Flux of blood by the Hæmorrhoids, *Menſes* or any other part; or when one makes water or ſweats, no man in his wits will ſay, that then the parts of a mans body are voided, although a man cannot live without blood and *ſerum*. But if pieces of the Lungs be brought up in coughing, or if pieces of the Kidneys be voided in Urine, as it ſometimes happens in their exculceration, then it is certain that the true parts of the body are voided.

Where the humors & ſpirits be parts of the Body.

Actions proceed from Solids.

Beſides, theſe are parts of the body, whence actions immediately proceed, and they proceed not from the humors and ſpirits, but from ſolids. For the humors and ſpirits move not the Heart, Brain, and other parts, but they both breed and move the humors and ſpirits: for when the Heart, Brain, and other parts are quiet, humors and ſpirits are neither bred nor moved (this appears in a deep ſwoon) and though there is abundance of them in the body, and thoſe very hot and fit for motion, as in ſuch as dye of a burning Fever; yet as ſoon as the Heart is quiet, they neither move through the Arteries, Veins and Nerves, nor are able to move the Heart, or any part elſe, which is a certain Argument that they are Paſſive, and that no Action can proceed from them. And that the humors and ſpirits are moved by the Heart, and bred in it and other parts, will more plainly appear, *lib.* 2. *cap.* 11. and *lib.* 3. *cap.* 10, 11. and in ſeveral other places.

Solids act not without the humors.

And now though ſolids cannot act without the humors and ſpirits, and by them their Actions (in as much as by their quantity, or quality, as their heat, cold, *&c.* they are able to cauſe this or that mutation or temper in Solids) are made quicker, ſlower, ſtronger, weaker, better or worſe; yet they are without

without air; yet air is no part of the body, neither does the Action of respiration proceed from it, but from the muscles of the breast forcing it out, though in the mean time air by giving way to the motion of the muscles, and passing in and out through the *Aspera Arteria*, affords such an aptitude for respiration, as without it no respiration could be performed; though also by its heat or cold it may make respiration quicker, slower, longer or rarer, according as by these mutations the heat of the parts is augmented or diminished, and thereupon necessity obliges one to breath quicker or slower. So the Heart and other solid Parts are not mov'd by the humors and spirits, but act upon the humors and spirits, they move, attenuate and concoct them till at length they turn their apt particles into a substance like themselves, and so apply and unite them to themselves, and make them parts of the body, which they were not before they were applied and assimilated. For one part of the body is not nourished with another part of its whole, a bone is not nourished with flesh, nor a vein with a nerve, *&c.* Neither can that which nourishes the parts, by any means be called a part, for otherwise there would be no difference between a part and its nutriment: With which Nourishment, unless the Parts be daily cherished, and their consumed particles restored, their strength and substance would quickly waste and fail, and by that failure at length their Action would be lost.

So that Man of necessity must have both Blood and Spirits for the support of Life (hence saith the Text in *Levit.* 17. 11. the *Soul* (that is the Life) *of the Flesh is in its Blood*) as being the nearest Support of the Body, without which neither the Parts of the Body can act, nor the Man himself live. Yet it does not follow from thence that the Blood and Spirits are part of the Body: For the same might be said of the external Air, without which no Man can live. For take away from a Man the use of external Air either by suffocation or drowning, or any other way, you presently deprive him of Life, as surely as if you took from him his Blood and Spirits. Yet no man of Judgment will say that the external Air is a part of the Body: Seeing that most certainly, if that without which Life cannot subsist were to be accounted a Part, the external Air must of necessity be said to be a Part of our Body, as well as the Blood and Spirits. Moreover it is to be considered, that if the Humors and Spirits have contracted any Foulness or Distemper, they are by the Physicians numbred among the Causes of Diseases, not among the diseased Parts. Besides, that if they were Parts, they ought to be similar, yet never any Anatomist that I ever yet heard of, recken'd 'em among similar Parts. For most of the *Organic* Parts are composed out of the Similar. And yet among those Similar Parts which compose the *Organic*, never did any one reck'n the Blood or Spirits, as *Similar* Parts. For all the Organs ought to derive their Composition from those things which are proper and fixed, not from those things which are common to all, and fluid, continually wasted and continually renewed.

IX. *Therefore the Body of Man may exist intire in its Parts without Blood, Spirits, and Air; but it cannot act, nor live without 'em.*

And thus a Man cannot be said to live without a rational Soul, and to be a perfect and entire Man; yet every one knows that the Soul is not to be reck'n'd among the parts of the corruptible Body, as being incorruptible, subsisting of it self, and separable from the rest of the Body; since, that being incorruptible, it cannot proceed from any incorruptible Body, but derives it self from a divine and heavenly Original, and is infused from above into the corruptible Body, to the end it may act therein so long as the Health and Strength of those corruptible Instruments will permit Actions to be perform'd. To which we may add, that an Anatomist, when he enquires into the parts of human Body, considers 'em as such, not as endu'd with Life, nor as the parts of a Rational Creature. Neither does he accompt the Causes of Life and Actions, by any manner of Continuity or Unity adhering to the Body, to be Parts; nor is it possible for him so to do.

And thus it is manifest from what has been said, That the Spirits and Blood, and other Humors neither are nor can be said to be Parts of our Body. Yet all these Arguments will not satisfy the most Eminent *J. C. Scaliger*, who in his Book, *de Subtil. Exercit.* 280. *Sect.* 6. pretends with one Argument, as with a strong battering Ram, to have ruin'd all the Foundations of our Opinion.

If the Spirit (saith he, and he concludes the same Thing of the Blood and Spirits) *be the Instrument of the Soul, and the Soul is the beginning of Motion, and the Body be the Thing moved, there must of Necessity be a Difference between*

the thing mov'd, and that which moves the Instrument. Therefore if the Spirits are not animated, there will be something between the thing enlivening and enliven'd, forming and form'd, which is neither form'd nor enliven'd. But the Body is mov'd because it is enliven'd. Yet is it not mov'd by an external but an internal Principle. Now it is manifest, that the Spirits are also internal, and that the internal Principle of Motion is in them, therefore it follows that they must be part of the Member.

But this Argument of the most acute *Scaliger*, tho' it seems fair to the Eye at first sight, yet (thoroughly considered) will appear to be without Force, as not concluding any thing of Solidity against our Opinion. For the Spirit is no more an Instrument that moves the Body, than the Air is the Instrument that moves the Sight or Hearing. So neither are the Spirits the Instrument of the Soul, but only the necessary *Medium*, by which the active Soul moves the instrumental Body; and also perceives and judges of that Motion so made in that Body. So that it is no such Absurditie (as *Scaliger* would have it to be) but a Necessity, that there should be something inanimate between the enlivening Soul, and the instrumental Body enliven'd, which is part of neither, but the *Medium*, by which the Action of the enliven'd instrumental Body may be perform'd by the enlivening Soul. *But*, saies *Scaliger*, *the Body is moved, because it is enlivened, and that not by an external, but an internal Principle.* We grant the whole; yet we deny the Spirits to be the *internal Principle*, when it is most apparent *that the Soul is the internal Principle* which operates by the assistance of the Spirits.

So that it cannot from hence be proved that the Spirits live or are Parts of the Body, but only that they are the *Medium*, by which the Soul moves the Body. But because that *Scaliger* spy'd at a distance a most difficult Objection, *viz. How the Spirits could be a Part of any corporeal Body, when they are always flowing and never in any constant Rest*, but continually in Motion *through all the Parts of the Body indifferently*, to avoid this Stroak, he says that the Spirit's a quarter of that part of the Body where they are at the present time, and when they flow out of that part then they become a part of that Body into which they next infuse themselves; and so onward. But this way of concluding of Arguments is certainly very insipid, and unbeseeming so great a Man, when it is plain from the Definition of a Part, that a part of our Body, is not any fluid and transient Substance but as it is joyned to the Body by Continuity and Rest.

Division of the Parts.

X. *The Parts of the Body are two-fold.* 1. *In respect of their Substance.* 2. *In respect of their Functions.*

XI. *In respect of their Substance, they are divided into Similar, and Dissimilar.*

XII. *Similar Parts are those which are divided into Parts like themselves.* So that all the Particles are of the same Nature and Substance. And thus every part of a Bone is a Bone; of a *Fiber*, a *Fiber*. Which *Spigelius* calls *Consimiles*, or altogether alike: the Greeks ὁμοιομερῆς, or of like Parts.

They are commonly reckoned to be ten: *Bones*, *Gristles*, *Ligaments*, *Membranes*, *Fibers*, *Nerves*, *Arteries*, *Veins*, *Flesh*, and *Skin*. To these by others are added the *Scarf-Skin*, *Tendons* and *Fat*. By others, the two Humors in the Eyes, the Glassie and the Crystalline; by others the Marrow, the *Brain*, and *Back-Bone:* And lastly by others, the *Hair*, and *Nails*.

Of these some are simply *Similar*, as the *Bones*, *Gristles*, *Fibres*, *&c.* wherein there is no difference of Particles to the Sight. I say, *manifest to the Sight*, for that in respect of the several smallest Elements, not to be perceived by the Eyes, but by the Mind, of which they are composed, no part of 'em can be said to be really and simply Similar. Others are only Similar as to the *Senses*, wherein there is a difference of Particles manifest to the Sight, as a *Vein*, *Arterie*, *Nerve*, *&c.* For a *Vein* consists of the most subtile *Fibers*, and a *Membrane*: An *Arterie* of *Fibers*, and a double different *Tunicle*. A *Nerve* consists of the *Dura* and *Pia Mater*, or Membrane, little *Fibers* and *Marrow*. Nevertheless to a slight and careless Sight they seem to be Similar, because they are every where composed after the same manner, and so are like to themselves, as not having any other Substance or Composition in the Brain, than in the Foot or any other Parts.

Of the several similar Parts we shall afterwards discourse in their proper Places.

Now all the similar and solid parts, in the first forming of the Birth are drawn like the Lines of a rough Draught in Painting, out of the Seed; to which the Blood and milkie Juice contain'd in the *Amnion*, and Membrane that wraps about

bout the Birth soon after joyning, nourish the Parts delineated, and encrease and enlarge their Bulk.

'Till of late, it was believed that the Blood of the Mother in the first forming of the Parts did concur with the Seed, not only as a material but effective Principle (which Opinion was afterwards exploded by all the most eminent Philosophers) and that some Parts shared of more Seed, others of more Blood, and others received an equal Share of both. And hence proceeded that old Division, which divided the Parts, in respect of this Principle of Generation into *Spermatic*, which in their Forming were thought to partake of more Seed than Blood, as the former eight *Similar* Parts. Others, into *Sanguine*, in the forming of which the Blood seemed to predominate, as in the *Flesh*. Others *mixt*, which were thought to be form'd of equal Parts of Blood and Seed, as the *Skin*. But this Diversity of the Parts, does not proceed from the first forming, but from the Nourishment, in respect of which some receiv'd more, others less Blood for the Increase of their Substance: Also others are more and more swiftly, others less, and more slowly encreased in their Bulk.

Spermatic, Sanguine, and Mixt.

Those Parts which are called *Spermatic* being cut off, never grow again, or being broken or separated, never grow again but by the assistance of a Heterogeneous Body. Thus a Bone cut off can never be restored; but it being broken, it unites together again by means of the *Callus*, or glutinous Substance, that gathers about the Fracture; but Parts made of Blood are soon restored, as is apparent when the Flesh is wounded or cut off.

Those that are mixed, are in the middle, between both. Nevertheless as to the Spermatic Parts, when broken or separated, some question whether they may not be united again without the help of a *Heterogeneous* Medium: and they believe that in Infants and Children, whose Spermatic Parts, as the Bones, are very tender may be united again by Vertue of a *Homogeneous Medium*. But seeing we find that even in Children and Infants, wounds of the Skin never unite without a Scar, nor fractures of the Bone without the assistance of the Callous Matter, 'tis most probable that in no Age the *Spermatic* Parts unite without a *Heterogeneous Medium*; though it be not so conspicuous by reason of the extraordinary Moisture of the Parts in new Born Children, and young People.

XIII. *Dissimilar Parts are those which are divided into Parts, unlike in Nature and Substance, but not into Parts like themselves.* Thus a Hand is not divided into several Hands, but into Bones, Flesh, Nerves and Arteries, *&c.* *Dissimilar Parts.*

XIV. *In respect of their Functions, the Parts are distinguished two ways.* 1. *Into Organic, and not Organic;* 2. *Into Principal and Subservient.*

XV. *Organical Parts are such as are design'd for the performing of Actions, and to that end have received a certain, determinate and sensible Conformation and Fashion.* *Organical Parts.*

Now that they may have an aptness for the Duties imposed, there are required in these Parts, *Continuity*, *fit Situation* and Number, proper Figure, and Magnitude.

Which Parts are not only Dissimilar, as was formerly thought, but also Similar. For Example, a *Nerve*, tho' it be a *Similar Part*, yet because it is entrusted with the office of Conveighing and distributing the animal Spirits; for this reason it is no less *an Organical Part* than a *Muscle*, or a *Hand*: and the same thing is also to be understood of a *Bone*, an *Arterie*, and a *Vein*. So that it is a frivolous distinction of *Caspar Bauhinus*, and some others, who while they endeavour to exclude *Similar* Parts, out of the number of *Organic*, distinguish betweeen *Instruments*, and *Instrumental Parts*; whereas indeed there is no more difference between 'em, than between *an Old Woman*, and *a very Old Woman*.

XVI. *Parts not Organic are those which have a bare Use, but perform no Action, as the Gristles, the Fat, the Hair.* *Parts not Organic.*

XVII. *Principal Parts are those which perform the Noblest and Principal Action.* *Principal Parts.*

By these the *Motions* of several other Parts are promoted, and from them proceed. And they are reckoned to be three in Number; two, in respect of the *Individual*; and one in respect of the *Species*. 1. The *Heart*, the Fountain of Vivific Heat, and the *Primum Mobile* of our Body, from whence the vital and Natural Actions proceed. 2. The *Brain*, the immediate Organ of Sense, Motion, and Cogitation in Man, by means of which all the Animal Actions are perform'd. 3. The *Parts of Generation*;

neration; upon which the Preſervation of the Species depends.

Subſervient parts. XVIII. *Subſervient Parts, are all thoſe that are uſeful and ſubſervient to the Principal: As the Stomach, Liver, Spleen, Lungs, Kidneys, Hands,* &c.

Noble. And theſe, as neceſſary to Life, are to be called either Noble, without which a Man cannot live, as the *Lungs, Stomach, Guts, Liver, and the like.* Others as not being neceſſary for Life, but are proper for ſome uſe or action, which renders Life more Comfortable, are to *Ignoble.* be called Ignoble, as *an Arm, a Finger, a Foot, a Hand, Ear, Noſe, Teeth,* &c. which we may want and yet Live.

To theſe may be added, thoſe whoſe Office is more mean and hardly manifeſt, as *Fat, Hair, Nails, and the like.*

Now that the Demonſtration of theſe Parts may be the more conveniently made plain, and deſcribed in their Order, we ſhall divide the Body of Man, according to the modern Anatomiſts into the three Ventricles, and Limbs.

XIX. *The Venters are certain remarkable Cavities, containing one or more of the Noble Bowels.*

In this Place the words *Cavity* and *Venter* are not to be ſtrictly taken for the Cavities themſelves only, but leſt the Members of this Diviſion ſhould be too Numerous, we would have comprehended under 'em at large, as well the containing Parts that form thoſe Cavities, as alſo the Parts contain'd within 'em: together with the Neck, or if there be any other parts annexed to 'em, which may be reckoned to the Members. Afterwards in the following Chapters, when we come to diſcourſe particularly of the ſeveral Venters, we ſhall more at large ſubdivide 'em into Parts Containing, Contained, and ſuch as are adjoining to them.

XX. *Theſe three Venters are the uppermoſt, the middle, and the lowermoſt.*

The uppermoſt Venter or Cavity. XXI. *The uppermoſt Venter or Cavity is the Head, wherein are contained the Brain, the Eyes, the Ears, and other Parts.*

Now there was a neceſſity that this ſame Tower of the principal Faculties ſhould be ſeated in the higheſt Place, to the end that being at a further diſtance from the places where the Nouriſhment is dreſt, the moſt noble Animal Functions ſhould not be diſturb'd by its Steams and thick Exhalations: partly for the convenience of the Senſes of Hearing, Seeing and Smelling, whoſe Objects more eaſily dart themſelves from a higher than a lower place into the Organs of the Senſes, and by that means become more perceptible.

The middle Venter. XXII. *The ſecond or middle Venter or Cavity is the Breaſt, the Manſion of the Heart, Lungs, rough Arterie or Windpipe, and the Oeſophagus or Gullet.* This the Great Creator placed in the middle, that as a King reſides in the mid'ſt of his Kingdom, ſo the *Heart* the moſt noble and principal *Habitaculum* of Life ſhould inhabit this middlemoſt Palace of the Microcoſmical Kingdom, and there ſit as in its Throne, from thence with more convenience to water the ſeveral Regions of the Little World with its Rivulets of enlivening Nectar and Heat.

The lowermoſt Venter. XXIII. *The third Venter which is generally called the lowermoſt, and concludes with the Abdomen or Paunch, as the ſeat of the Liver, Stomach, Guts, Reins, Womb, and many other parts, ſerving for the Concoction of Nouriſhment, Evacuation of Excrements, and Generation of Off-ſpring:* therefore neceſſarily to be placed lowermoſt, leſt the manifold diſturbances and abominable filth of this Kitchin ſhould annoy the ſuperiour principal Viſcera in their Functions.

Limbs. XXIV. *Limbs are the Members adjoyning to the Venters, and diſtinguiſh'd with Joynts.*

Theſe being granted to Man for the better accommodation of Life, are twofold, Arms and Legs.

XXV. *The Arms in Man, are divided into the Shoulders, Elbows, and Hands: The Legg is divided into the Thigh, the Shin, and Foot.*

A Diviſion of the Work. According to which Diviſion we have divided this our Anatomy into ten Books. In the firſt four of which ſhall be explain'd the Hiſtory of thoſe things which are contain'd in the ſeveral Cavities and Limbs. In the ſix latter we ſhall diſcourſe of thoſe things which are common to the whole Body, *the Muſcles, Membranes, Fibers, Arteries, Veins, Nerves, Bones, Griſtles, and Ligaments.*

CHAP.

CHAP. II.

Of the lowermost Venter in general.

I. *IN regard the lowermost Venter contains in it several moist Parts which are liable to putrefaction, the sink of many Dregs, therefore Anatomists begin their Dissections from thence,* to avoid the effects of swift putrefaction, and to remove those Bowels first out of the way, which might soonest infect the whole Body, and so prevent a requisite consideration of the rest.

Nomina. II. *This Venter* Aristotle (Hist. Anim. lib. 1. c. 13.) *properly calls* γαστέρα: *the Common People simply the Belly, in a more reserved signification:* which *Celsus* willing to distinguish from the superiour *Venter*, calls *Imum Ventrem*, the lower Belly.

The lower Venter. III. *The lower Venter is all that Cavity, bounded above by the Sword-like Cartilage and the* Diaphragma *or Transverse Muscle; on each side by the lower Ribs, behind by the Joynts of the Loyns; and below, by the Bones of the Hip, the* Os Sacrum *and Share-bone, or* Os Pubis.

IV. *The fore parts of this Cavity adjoyning to the lower Cartilages of the Ribs, and comprehended under 'em, were by the Ancients call'd* Hypochondria *and* Præcordia; being two, a Right and a Left.

Epigastrium. V. *All that which falls upon the middle Ventricle of the* Hypochondria, *and the Gutts next to it, for more clear distinctions sake, with* Vesslingius, *is call'd* Epigastrium, tho' *Riolanus* will have it to be the *Region of the Stomach:* But the Ancients gave the name of *Epigastrium* to the whole *Paunch*; which the *Arabians* call'd *Myrach.* In the upper part of this *Epigastrium* is a certain *Cavity*, by the Greeks call'd φρὴν, καρδία and στόμαχος; by the Latins *Scrobiculus Cordis.*

The Region of the Navel. VI. *The middle Region is the Region of the Navel, lying equally from the Navel three fingers above and below,* whose sideling Parts are by the Greeks call'd λαγόνες, by the Latins *Ilia*, because the Gut *Ileum* lies chiefly conceal'd under those places.

Hypogastrium. VII. *That part which is comprehended between this Region and the Space of the Share, is call'd the* Hypogastrium, Imus Venter, *and* Aqualiculus. Whose lateral Parts from the bending of the Hip to the Share, are call'd *Inguina*, or the *Groyns.*

The Share. VIII. *The Share, by the Greeks* ἐπίσειον, *is that part next above the Privities covered with hair in persons grown to full Age.* Of each side of which are the βουβῶνες, which the Latins call *Inguina*, or the *Groyns.*

Perinæum. IX. *The lower part between the Root of the Yard and the Fundament, is call'd the* Perinæum.

Loyns. X. *The hinder parts of the Paunch or Abdomen above, are fill'd up by the Loyns or* Lumbi, *below by the Buttocks or* Clunes, *which the Greeks call* γλουτοὺς *and* γλύπα.

Buttocks. The Cleft dividing the Buttocks by *Hierophilus* is call'd διχάλα, where the hole of the right Intestine breaks forth, vulgarly call'd the *Podex* or Fundament.

XI. *This Venter consists of parts containing, or external, or of parts contain'd or internal.*

Abdomen. XII. *The Containing, which they properly call the* Abdomen *or Paunch, are either common or proper.*

XIII. *The parts contain'd are adapted either for Nourishment, Evacuation of Excrements, or Generation.*

The Physiognomists affirm that notable Conjectures may be made concerning the Disposition of Men from the form and bigness of this Belly. Thus *Aristotle* affirms that a little Belly is one of the principal Parts from whence Wisdom appears in man. Among others, a *flat* and *hollow Belly* denotes a man envious and covetous. A round Belly betokens sobriety. A swag-Belly marks out a sleepy, slothful, stupid Fellow. A Navel swelling out very much, is a sign of a person given to Venery.

CHAP.

CHAP. III.

Of the common Containing Parts; and first of the Cuticle and Skin.

I. *THose are said to be the Common containing Parts, that infold not only this Belly, but cover all the rest of the Body except the Yard, the Scrotum, or Cod, the Eyelids, and some other parts that want Fat.*

The containing parts.

II. *These are, the Cuticle, the Skin, the Fat, the fleshy Pannicle, the Membrane common to the Muscles.*

Cuticle.

III. *The Cuticle, or Scarf-skin, which the Greeks call* ἐπιδερμις *(as it were a thing spread over the Skin) is a thin, fast, insensible little Skin spread over the Cutis, and so closely sticking to it, that it cannot be parted from it, but by the raising of little Blisters by the force of Fire or Vesicatories.*

Sometimes double.

Aquapendens observed it sometimes double under the Vesicatory, divided into two very thin Skins, an outermost somewhat closer, and an innermost much thinner, and sticking so close to the Skin, that it cannot be taken off with a Penknife; which was so provided by Nature, that seeing the Skin is subject to outward violence, that if one Skin should perish, the other might remain entire, and supply the uses to which the other was design'd.

Original.

IV. *It is said to grow from the moisture of the Flesh condens'd by the dryness of the ambient Air*; but erroneously, in regard it appears to have a Seminal Principle as well as the Skin, or any solid Parts.

The use.

It covers the Skin, and shuts up the Mouths of the Vessels that extend to the Skin, and moderates its exquisite Sense, and prevents the overmuch running out of the moisture.

Julius Castor of *Placentia*, and several other Anatomists, will not allow it to be a part of Human Body, for four Reasons.

1. Because it was not produc'd out of the Seed in the first forming of the Parts; but afterwards arises from the Excrements of the third Concoction condens'd and dry'd by the Cold, like the film that grows upon Porridge. Which they say is apparent from hence, that when it is taken away or scrap'd off, it easily grows again, which the Spermatic parts never do.

2. Because it is void of Sense; nor is it wasted, as the other parts are, by Diseases.

3. Because it does not live.

4. Because it performs no action.

But all these Arguments are of no force, as being full of manifest contradiction. For by the unanimous consent of all Anatomists, even of those that propose these Arguments; it is allow'd to be the first and outermost of all the containing Parts; in which particular they had all very grosly err'd, were it not a part of Human Body. But let us see what weight their Arguments carry.

To the first we say, That the smallest Threds or Fibres of it were form'd out of the Seed, in the first delineation of the Parts. Which is apparent in all Abortions covered with a Skin, where there is always a Scarf-skin to be seen; which could not be generated by the external Cold, for there can be no such thing in the clos'd Womb; nor by the driness of any ambient Substance, there being no such thing that can touch the Birth swimming in a moist milkie Liquor; and therefore proceeds from some small portion of the Seed. Which is apparent in Ethiopian Infants, as well brought forth in due season, as ejected by Abortion, who bring the external blackness along with 'em out of the Womb. Which Colour only dyes the *Scarf-skin*, and not the Skin (as *Riolanus* observ'd in the Dissection of an Ethiopian, whose Scarf-skin or Cuticle was only black, the Skin it self being whiter than Snow.) If now they receive that blackness from their first Formation in the Womb, then the Cuticle into which that Colour is incorporated in the very first forming of the Body, had its Original with the rest of the Parts out of the Seed; not from any Excrements, or Viscous Exhalations, in regard that no such things can be at the beginning of Formation. As for its growing again when cut away or rub'd off, it has that quality common also to the Teeth, which are daily worn by Mastication, yet grow again (concerning which see *lib. 9. cap.* 10. following.) Nay we find, that in the change of Teeth, the greatest part of 'em shed themselves, and afterwards come again. The same quality also is common to the Sanguin Parts; which are not excluded however out of the number

ber of Parts, because they grow again when taken away: seeing they have such a copious nourishment of Blood, that easily admits of such a Restoration. And thus from the ends of the Vessels of the Skin, which it covers and shuts, certain Exhalations breath continually forth like a kind of Dew from the Blood to the Cuticle, for its nourishment, which is sufficient easily to restore its decay'd and wasted Particles.

Then if it be generated, as they say, like a Film growing over Milk thickned with flower, that proves it to be a part of the Body, proceeding from the same Principle with the rest. For that same cream or film in Milk, is not the Excrement of the Milk condens'd, nor any thing extraneous to the Milk, but the thicker part of the Milk, and therefore the Milk.

To the second, we say, that though it be not sensible, nor wasted manifestly in Diseases, yet is it no less a part of the Body than the Bone, which is neither sensible, nor does seem to be wasted.

To the third, we say, 'Tis a false Assertion, that it does not live; for it increases and grows with the rest of the Body, (which Parts not living never do) and is nourished with Alimentary Juices, like the rest of the Parts. Which Juices, though they cannot be manifestly perceived by the sight, that signifies nothing, for that happens to those Juices that nourish many Bones, and the *Periostea* or Membranes that enclose the Bones, the Teeth and many other parts. Besides, it is subject to its Diseases proceeding from bad Humours and Blood, as is apparent in the Leprosie, the Meazles, and many other disaffections. In some it is thinner and softer, in others thicker and harder. But such differences deprive the Cuticle of Life, no more than the Skin, which is subject to the same variety. Lastly, who can be so sottish to believe that our whole living Bodies should be covered and born with a dead substance or matter round about it.

To the *fourth* we say, That though it do not act, yet the use of it is absolutely necessary; and consequently that it is no less a part of the Body than a Cartilage or Gristle, the Fat, many Membranes, Flesh, and other Parts which are very useful, but perform no action at all.

Therefore we must conclude it a true part of Human Body: 1. Because it is one of those things that fill up the space; for a man without a Cuticle is not a compleat whole man: 2. Because it adheres in Continuity to the Body: 3. Because it is appropriated as aforesaid to a certain necessary use.

V. *The Skin, Cutis, Νεμα & Νεγς, as it were Νεμα, a Band tying together the parts of the Body; in Brutes* Pellis *and* Corium, *the Pelt or Hide is a covering Membranous, thick, generated act of the Seed, and cloathing the External Body, as well to measure the excesses and differences of tactible Qualities, as to preserve it against the assaults of accidental Violences.* *The Skin.*

VI. *It consists of a Substance proper to it self, being of a middle Nature, between a Nerve, a Membrane, and Flesh.* For it is not without Blood, nor so quick of feeling as a Nerve; not so thin as a Membrane; nor so full of Blood as the Flesh; but it is indued with Blood, and as it were a Membrane somewhat sinewy and somewhat fleshy, which by vertue of its fleshiness, enjoys a greater thickness than any Membrane; and by vertue of its Nervosity has an acute and quick sense. *Its Substance.*

Aristotle seems to allow it a Substance plainly fleshy; for (in the 29th *Problem, & l. 2. de generat. Animal. c. 6.*) he affirms the Cutis or Skin to be produced of the Flesh growing dry. In which sence also *Columbus* (*l. de Spir. c. 5. & 8.*) calls the Skin the Exiccation or drying up of the Flesh. With whom *Galen*, 3. *Method*, and *Fernelius l. 5. Pathog. c. 8.*) seem to consent, saying, That the Skin is the dryer part of the Flesh that lyes underneath it. But seeing there is so great a difference between the Substance of the Skin, and the Flesh that lies under it; and for that the Skin is almost every where separated from the Flesh by the Fat that runs between, and the *fleshy Panicle*, it is apparent that the Skin can be no part of the dry'd up Flesh. I say *almost every where*, for in the Forehead it sticks so fast to the *Muscles* under it, that it follows their Motion, and seems to be united to 'em, though in truth it be a part subsisting of it self, and not generated by the Flesh of the Muscles, but only most closely fixed to it. Whence we must conclude that the Skin owes its Original to no other part; but that it was produced in the first forming the Parts no less immediately from the Seed, and obtained a Nature no less proper to it self, than any other of the Parts.

Lindanus affirms the Substance of it to be twofold; the outward Part, nervous; the inward part fleshy. For he likens the Skin to the rind or peel of an Orange; whose

whose exterior yellow Substance is thinner, harder, thicker, and more porous. The inner white part thicker, softer, looser and more spungy: and so he believes the Skin to be. And *Massa* is of the same Opinion, who writes that the Skin consists of two little Skins, and that they may be divided by the edge of a Razor.

The Difference. VII. *In respect of the Substaace the Skin differs in thickness, fineness, thinness, and hardness, according to the variety of Temperament, Age, Sex, Regions, and Parts.*

Whether the Instrument of Feeling? Here *Spigelius* proposes a Question, *Whether the Skin be the Instrument of Feeling?* Which *Aristotle* and *Avicen* seem to deny, but *Galen* and his Disciples affirm to be true. For the Solution of the Question, this is briefly to be said: That the Membrane is properly the Instrument of feeling; and hence the Skin, as it is a Membrane, may be said to feel. But because that other thicker Parts not feeling of themselves are intermixed with the Sensitive Particles, hence it comes to pass, that its feeling Faculty is in some measure moderated, that it might be neither too dull, nor too quick.

The Temper. VIII. *It is temperate in the first Qualities, and enjoys a moderate Sense of Feeling.* For in regard it is subservient to the Sense of Feeling, to the end it may be able the sooner, and with less detriment, to feel External Injuries, before the Inward Parts receive any Dammage, it ought to have a mean temper between the tactible Qualities; by means of which it might be able to perceive all Extremities. And because the Constitution of tactible Qualities is generally felt and examined by the Hands, therefore the innermost Skin of the Hands is most exactly temperate, and of a moderate sensibility, so it be not become brawny by laborious Exercise.

The Figure. VIII. *The Figure of it is plain and Flat; nor has it any other Properties peculiar to it self, but such as it borrows from the Parts subjected to it; according to whose Shape it is either Level or Unequal, Prominent or Extuberant, Contracted or Depressed.*

In many Parts it has various Lines and Wrinkles according to the variety of its Motions; from the Inspection of which in the Hand the Art of *Chiromancy* promises Wonders.

Motion. IX. *It never moves of it self but when it is mov'd, and then it is mov'd either by the Part which it invests, or by the Muscles annexed to it,* as in the Forehead and hinder part of the Head.

Nourishment and Vessels. X. *It is nourished by the Blood infused into it through innumerable little Arteries.* It has innumerable little Veins, of which several discharge themselves into the *Jugulars*, the *Axillars*, or *Armhole*-Veins, the Epigastric's, Veins of the Loynes, and *Saphænæ* or Crural Veins. Innumerable other Veins also return their Blood to the Heart invincibly through some other greater Veins. It receives the *Animal Spirits* through the *Nerves*, of which the numberless small Branches, and little Fibers terminate in the Skin from the parts beneath it; and contribute to the quickness of its Feeling.

The Pores. XI. *It is of a continuous or connexed Substance, except only in those places where there is a necessary Perforation for the Entrance and Egress of things necessary,* as the Mouth, the Nostrils, the Eyes, the Fundament, the Womb, the Pores, *&c.*

Hair. XII. *In many places it is hairie, as upon the Head, the Share, the Chin, the Lips, the Armpits; moreover, but especially in Men, upon the Breast, the Armes, Thighs, and Leggs.*

But as for the Quantity, Colour, Length, Thickness, and fineness of Hair, there is a very great Variety according to the Temperament and Constitution of the Body.

Colour. XIII. *The Colour of the Skin is various.* 1. *According to the diversity of Regions. Hence some are deep Yellow, like the Scythians:* Others *bright Yellow, as the Persians, according to* Hippocrates. Others *Black, as the Ethiopians, Brasilians, and Nigrites.* Others *between Yellow and Black, as many of the Indians.* Others *between a deep Yellow, Red, and Black, as the Mauritanians.* Others *White, as the Europeans.* 2. *According to the Variety of Temperaments and Humors therein contained.* Hence the Flegmatick are Pale, the Choleric Yellow, the Melancholy Swarthy, and the Sanguine Fresh and Lively. 3. *According to the Variety of the parts of the Body:* For if it stick to the Flesh, as in the Cheeks, it is more ruddy, if too much

much Fat, it looks pale; if to a dry and wrinkled part, brown and dull; if it lye over great Veins, it looks blue.

The Use. XIV. *Whether Action or Use be to be attributed to the Skin is disputed.* *Galen* will allow it no Action. *li. de Caus. Morb. c. 6.* And therefore affirms it to be form'd by Nature particularly for Use. On the other side *Julius Casser* of *Placentia l. de tact. org. sect. 2. c. 1.* besides Use ascribes to it a certain publick Action, so far as it performs the Act of Touching or Feeling, and discerns and judges of Qualities. *Aristotle* agrees with *Galen*; and many Arguments uphold *Casser*, which he rehearses and weighs in a long Discourse. *l. Citat. à cap. 1. ad 9.* And there also at the same time disputes of the Organ of Feeling, from *Chap.* the 10. to the 19. of the Book even now cited.

CHAP. IV.

Of the Fat, the fleshy Pannicle and Membrane of the Muscles.

Fat. I. FAT, *is an unctuous or oylie Substance, condens'd by Cold to the thinnest Membrane lying upon the fleshy Pannicle, and closely joyn'd to it, produced out of an oylie and sulphureous part of the Blood*, which being spread under the Skin, excludes no less the penetrating Injuries of Cold, than it hinders the immoderate Dissipation of the natural Heat, moistning the inward Parts, and facilitating their Motion.

When I say it is condensed by *Cold*, then by *Cold* I mean a *lesser Heat*, not an absolute Frigidity void of all Heat. Which is explain'd at large by *Andr. Laurentius.* Anat. *l. 6. c. 6.* Where by many Reasons and Similitudes he clearly demonstrates, how a lesser Heat may make a Condensation. *Valesius* also weighs and decides all the Arguments brought to and agen upon this Subject. *Controvers. Med. & Philos. l. 1. c. 10.*

The Substance. II. *The Matter of Fat is Blood: Hence it comes to pass that where Blood is wanting, there is never any Fat or Grease.* And that not every sort of Blood, but such as is prefectly concocted, Oyly and Sulphureous, made by Concoction out of the most airie and best part of the Nourishment. Hence it comes to pass, that such Persons whose Blood is not Oyly (tho' plentiful) but hot, Melancholic, Choleric, ill Concocted, Serous, Salt, or which way soever sharp as in Scorbutics and Hypochondriacs, never become Fat. For that through the vehement and sharp Fermentation, occasioned by the acrimonious Particles, the oylie Sulphureous Particles in the Blood either are not generated in sufficient Quantity; or being generated or consum'd, before they can be separated from the sanguine Mass, and grow to the Membranes. Hence it is manifest wherefore Children are tenderly plump, but never Fat, because their Blood is very Serous, and the more thick and oyly parts of it, are wasted in the Nourishment and Growth. Therefore *Aristotle* in his *History of Animals l. 3. c. 13.* writes, *That all Creatures of riper Age sooner grow Fat than such as are young and tender, especially when they are arrived at their full Growth of Length and Breadth, then they come to augment in Profundity.*

The efficient Causes. III. *The Primarie efficient Cause is moderate Heat (not too fierce, as that which dissipates overmuch, nor too little, which neither concocts well, nor dissolves the concurring Vapors) the secondary Cause is the Condensation of those Vapors raised by that Heat to the colder Membranes.* Nor is it a Wonder that Condensation should be made, when those Vapors light upon the Membranes not absolutely cold (tho' they are said to be cold in respect of other Parts that are hotter) but moderately hot as is before said. As we see melted Lead, when it is remov'd from the Fire condenses again tho' the place be very warm, however not so hot as the Fire.

Nevertheless those oyly sulphureous Vapors do not only light upon, neither are they always condensed upon the Superficies of the Membranes, but if the Members are sufficiently Porous, they insinuate themselves into their Pores, and spread over the whole Membranes, where they embody together, and become a part of 'em; and by that means the Fat is dispersed through those universal Membranes, as it is done in that Membrane which lyes next under the Skin. But if the Membranes are more firm and thicker, then the Fat adheres only to their Superficies, as we find in the Intestines, the Heart and some other Parts that are fortify'd with a

firmer and more compacted Membrane.

Fat Kernels, and Passages of the Fat.

IV. *The learned* Malpighius (*exercit. de Om. Ping. & Adip.*) *makes an Enquiry what that is, by means of which, the Oyly and Fat Particles are separated from the Sanguine Mass, seeing that Heat alone (which can raise indifferently any Vapors from the Blood, but not particularly separate the oyly Vapors from the rest) is not sufficient to do it.* Whence he conjectures that that Separation is made by the means of certain Kernels, appropriated only to that Duty, and that by others the oyly Particles are infused into certain Channels or Passages, which he calls *Ductus Adiposos*, or Channels for the Fat, and through which they are spread up and down upon the Membranes. In which place he brings several Arguments to support this new Speculation of his. Which new Discovery of so great a Man, is not to be despised, nor to be rashly rejected; but to be more seriously considered; in regard the following Reasons render it somewhat Doubtful. 1. Because the Kernels never appear to sight, nor can be any where demonstrated. 2. Because the certainty of the Passages of the Fat and their Cavity, is a thing as much to be disputed. 3. Because the Fat or oyly Matter is somewhat Viscous, and therefore not so lyable to be separated from the Blood by invisible Kernels; or to pass through the imaginary Cavities of invisible Channels, when the most subtle Animal Spirits which are liquid and not viscous at all, cannot pass through the invisible Pores of the Nerves, but that they are stopp'd by every slight Obstacle, more especially by the least quantity of viscous Humor, as we find in Palsies. 4. For that a fat Sweat breaths forth from the Bodies of many People, when it is a thing not to be believed, that these sort of Kernels are every where inwardly annexed to the Skin of the whole Body.

The Temperament.

V. *Whence it is apparent, what is to be thought of the Temperament; that is to say, that Fat is moderately hot, tho' it condense in the Cold, and be less hot than Blood.* Which Temperament appears, 1. From the Matter of it, which is Blood concocted, airie and sulphurie. 2. From the efficient Cause, which is Heat. 3. From the Form, which is Oylines. 4. From the End, which is to help the Concoction of the Parts; and by its temperate Heat to defend against the external Cold. 5. For that it is easy to be set in a Flame. Of which *Galen* thus writes, *l.* 4. *de usu part. c.* 9. *That Fat is hot, is known to the Sense it self, by those that use it instead of Oyle.* And this also more especially manifests it to be true, because it's easily set on a light Flame, as approaching nearest the nature of Flame; for nothing cold is suddenly kindl'd.

Whether it has any peculiar Membrane?

VI. Picolominus *has asserted that Fat grows to a proper Solid but most thin Membrane (as we have already affirm'd) for that in Living Creatures the oylie Vapors of the refin'd Blood, would breath out in great Quantitie through the Pores of the Skin, unless some thick and cold Membrane* (which *Malpigius* calls the *Adipous* Membrane) *should restrain and curdle 'em together.* But *Riolanus* in his *Anthropogr.* believes there is no need of any particular Membrane for that work, in regard that Condensation may be well enough performed between the thickness of the Skin, and the fleshy Membrane (perhaps as it grows outwardly to the Intestines and Membranes of the Kidneys: Which he proves from hence, for that in fat Bodies, especially in Women, the fleshie Membrane lyes wrapt up in Fat, as it were in the middle of it. And the same thing is prov'd by others by this Experiment, that if Fat be melted at the Fire, there does not remain any Membrane proper to it but only the *fleshie Membrane.* Hence *Riolanus* believes that Fat is not to be taken for any peculiar Part, since it seems to constitute but one only part with the fleshie Membrane. Yet the same *Riolanus* (in *Enchirid. Anatom. l.* 2. *c.* 7.) reclaiming his former Opinion, attributes a peculiar Membrane to Fat. And this is that which we also believe. For if the Fat which lies under the Skin be pull'd off with the Fingers, you may easily perceive its more close and fast sticking by means of the Membrane; and tho' the fleshie Membrane be sometimes overspread with Fat, as sometimes it happens to the Intestines and other Membranous Parts, this does not prove, but that the Fat it self, which is extended over the whole Body under the Skin, has its own proper Membrane.

VII. *But here some will object, This Membrane then at the first forming of the Birth ought to have been form'd out of the Seed with the rest*

rest of the solid Parts. But neither in Abortives, nor in Infants newly born, any Flesh is observ'd to lie under the Skin, therefore there can be no such Membrane there as that to which the Fat is said to adhere.

I answer, That that Membrane in all new born Infants is most certainly form'd, but by reason of its extraordinary close sticking to the fleshy Pannicle, it is not so easily to be discovered. I remember once that in a certain large and fleshy Infant, that was Still-born, I found something of a small peice of Fat, like a kind of Froth, sticking to the Membrane, and as a Rarity not usually to be seen so soon, I shew'd it to all the Lovers of Physick that were by. *Peter Laurembergius* also seems to agree with us in this particular; as he, who in his *Anat. l.* 1. *c.* 8 demonstrates, That the Fat (he should have said, rather, the Membrane to which the Fat will afterwards grow) is form'd in the Womb, and that there never was any Child born without Fat (that is, without the Membrane) surrounding the Body and the Caul.

The Fatty Membrane.

VIII. *As the Fat which incompasses the Body grows to its own Membrane, so the same thing happens in the Fat of other Parts. For whereever Fat is to be found, as in the Intervals of the Muscles, the Heart, the Kidneys and other parts, there are to be found many thin Membranes, like little Baggs or hollow Lappets, hanging at the Ends of the Vessels, which adhere to another thicker Membrane spread underneath as it were a Base and Foundation.* In these the Fat or oyly Matters of the little Bagg being separated from the Blood are condensed and collected; and so out of several little Baggs filled with oyly Matter, being mutually clapt together, at length are made huge Portions of Fat. *Malpighius* also, by the help of his *Microscopes*, has observ'd that the said little Sacks are variously formed, some being flat, others oval, others of another Shape, and that they are knit together partly by the Membranes of which they are formed, partly by the little Net of the Vessels. Nevertheless it is to be observed, that these little membranous Baggs do not grow to all the thick Membranes, which is the reason that Fat does not grow to all Membranes; as in the Lights, Bladder, the *Meninges*, or Membranes of the Brain, the Liver and Spleen, *&c.* in regard that no such membranous Baggs do grow or hang to the Membranes that cloath and invest 'em. Then, as for the Bones it may be questioned in some measure, whether their own Cavities do not supply the place of membranous Baggs, (which Cavities in the larger Bones are bigger, in the lesser Bones, lesser and Spungy) or whether any membranous Baggs may be contained in those Cavities, in which the fat Marrow is collected. Which latter seems to be therefore so much the more probable, for that the Marrowy Fat seems to be in a manner interwoven with little *Fibres* and Membranes.

Whether any part of the Body.

IX. *Others there are who farther extend the foresaid Doubt concerning the Membrane of the Fat, and do not put the Question, whether the Fat encompassing the Body, either alone, or together with the Membrane to which it sticks, be a Part of the Body it Constitutes; but whether it be any manner of way to be reckoned among the Parts of the Body?* They who maintain the Negative affirm, 1. That it is not a spermatic Part engendered out of the Seed. 2. That it is not endued with Life like the rest of the Parts, because it sometimes grows and sometimes wastes Insensibly. 3. For that in case of Hunger and Famine it turns into the Nourishment of the other Parts, whereas one Part cannot nourish another. 4. Because it performs no Action. 5. Because it is not restrain'd within any peculiar Circumscription. But because the Affirmative seems to me the more fit to be embraced as the truer, I answer, *to the First*; that the first and least Delineaments of the spermatic Parts, are only engendered out of the Seed, which at the first are so thin, that they can hardly be discern'd by the Eye, or else lye hid, as in the Teeth and several other Parts, which do not appear till long after, when enlarged and encreased by the Nourishment which is daily afforded 'em: And so also it is with Fat. *To the Second*, That as the Muscles through Diseases insensibly decay, and yet it cannot be said that they are not endued like the rest of the Vessels with Life, thus also the Increase or Decrease of the Fat is no Proof that the Fat is not also endued with Life like the rest of the Parts. *To the Third*, I answer, That it is not true, that the Fat turns to the Nourishment of the rest of the Parts in

caſe of Famine; but rather that is moſt certain, That the Fat is waſted alſo by long abſtinence, like the other Parts, when depriv'd of its Nouriſhment. *To the Fourth*, I ſay, that *Galen* (*l. 6. de placit. c.* 8.) allows Action to Fat, by underſtanding Uſe, as he alſo in many other places confounds Action and Uſe, tho' in reality there be a great difference between 'em. Beſides that the Cuticle, the ſpungy Bones of the Noſtrils, the various Membranes, the Hair and other Parts, tho' they perform no Action, but only ſerve to ſeveral Uſes, are therefore not excluded out of the number of the Parts; for which Reaſon there is as little cauſe for the excluſion of Fat from the ſame Number. *To the Fifth*, I affirm, That it is reſtrain'd within its own Circumſcription, tho' not contracted to a Point, in like manner as the Fleſh, which has no Circumſcription exactly determined; beſides we know that the Figure makes nothing to the Eſſence of the Part.

Colour. X. *The Colour of Fat in Men, as well as in brute Beaſts, differs ſomething according to Age. For in Youth it is of a yellowiſh, or rather roſie kind of Colour; in elderly People ſomewhat enclining to White; but in decrepit People altogether White.* Tho' theſe Rules are not ſo general in any Age, but that there may be ſometimes an Exception, and the Sport of Nature may be obſerv'd. *Laurembergius* attributes this Diverſity of Colours to the Qualities of the Blood: Not without reaſon. Others would rather deduce it from external Cauſes. But theſe will agree with *Laurembergius*, if we will allow the Qualities of the Blood to be changed by external Cauſes: And ſo the Blood may be ſaid to be changed by the Variety of Cauſes.

XI. *Fat is either internally thickened in the internal Parts or external, ſpread next under the Skin, of which we chiefly ſpeak in this place.* This is circumfuſed over all the Body, except the Lips, upper part of the Ear, the Eye-brows, the Cods, and the Yard, to which it would be but a Burthen.

The Plenty of it. XII. *It differs alſo in Quantity ſeveral Ways.* 1. *In reſpect of Age: For in florid Age, it is more plentiful than in Childhood and Old-age.* 2. *In reſpect of Sex: For in Women it is more plentiful than in Men.* 3. *In reſpect of the Temperament, Region, and Time of the Year: For it leſs abounds in hot and dry than in cold and moiſt Tempers.* 4. *In reſpect of Motion and Reſt: For ſedentary and lazy People are more ſubject to be fat, than they who are given to Exerciſe, or conſtrained to hard Labor.* 5. *In reſpect of Dyet: For they that feed upon coſtly Dyet, and indulge their Appetites, and make uſe of Nouriſhment of plentiful and good Juice, are more ſubject to be fat, than they that live ſparingly.* 6. *In reſpect of the Parts themſelves: For it is more plentiful in thoſe Parts where it is of moſt uſe, as the Abdomen, Breaſts, Buttocks; more ſparing in thoſe Parts where it is of little Uſe, as the Hands and Feet; but none at all where it is unprofitable and burthenſome.* 7. *In reſpect of Health: For healthy People are fuller than ſickly and diſeaſed.*

Adeps or Suet. XIII. *Suet grows to the internal Parts, being the ſame with* Pinguedo *or Fat in a large Senſe. But to ſpeak ſpecifically, it differs from Fat, for that this is ſofter and more moiſt, eaſily melted, and being melted, does not ſo eaſily congeal. Whereas Suet is harder and dryer, is much longer in melting, and being melted, more difficultly hardens again.* This is certain however, that ſeveral Phyſicians uſe the Word promiſcuouſly, and call any oily Subſtance of any Creature *Fat*, *Greaſe*, or *Suet*, as they pleaſe themſelves; which is alſo to be found in *Galen*: who is frequently careleſly negligent of making any Diſtinction or Property between theſe Words; and *l.* 2. *Sympt. de pingued.* thus writes; *If thou wilt call every oily and fat Subſtance in Animals Greaſe; but Fat may be taken for the whole Genus of that ſort of Subſtance.*

The fleſhy Pannicle. XIV. *The fleſhy Pannicle, fleſhy Membrane, and membranous Muſcle, by the Greeks ὑμὴν σαρκώδης, is a ſtrong Membrane full of fleſhy Fibres, eſpecially about the Forehead, Neck, hinder part of the Head, and Region of the Ears, ſpread over the whole Body, as well for Covering as Defence, endued with an exquiſite Sence, ſo that being aſſail'd with ſharp Ra-*

pers,

pers, it causes a quivering and shaking over the whole Body.

Situation. XV. *This Pannicle in Man lyes next under the Fat, and extends it self to those parts that want Fat, as the Eye-lids, the Lips, the Cods and Yard.* In most Brutes it is spread under the Skin, to which it sticks very close, and has the Fat lying under it. By the benefit of which, many Creatures have a Skin that is easily moveable, by means whereof they shake off Flies and other troublesome Insects, as we find in *Cows*, *Harts*, and *Elephants*.

Connexion. XVI. *It sticks most closely to the Back, and is there thickest, and therefore is vulgarly said to derive its Original from thence.*

In the Neck, the Forehead, and the hairy part of the Head it can hardly be separated from the Muscles that ly under it, and it is so firmly knit to the broad Muscle, that it seems to compose it.

Colour. XVII. *It is somewhat of a ruddy Colour in new-born Infants, in People of riper years it is somewhat white.* Which Colour however varies somewhat according to the Fat, the Vessels and Fibres annexed to it; so that it is sometimes more pale, and sometimes between both.

Zas's absurd Opinion of the Use. XVIII. *The inner part is smear'd over with a slimy Humour, to make the Muscles slippery, and render their Motion more easie.*

N. Zas in his little *Dutch Treatise* of the *Dew of Animals*, ascribes a most unheard of Use to this Membrane. For he affirms that it attracts to it self the serous Humours from all parts, and that it is the real Receptacle or common Seat of the *Serum* or *Dew*. Which serous Humour flows from thence into all the Spermatic parts, and washes away all their Impurities. That it is the Spring and Source of all our Sweat; and that in all Distempers of the Joynts, it poures forth an incredible quantity of gravelly water, vulgarly call'd *Aqua Articularis*, or Joynt-water, with many other fantastical Dreams (as he was taught by his illiterate Master *Lodowic de Bils*) concerning this Membrane, which he frivolously indeavours to impose upon others; altogether ignorant that there is no attractive virtue in this Membrane at all, nor any receptacle or place where such a manifest quantity of the serous Humour or Dew, much less any great quantity, sufficient to be sent to all the Spermatic Vessels, and to be emitted by Sweat; neither are there Pores sufficient to receive so great a quantity in so compact and thin a Membrane: Moreover, in the Dissections of Bodies, as well living as dead, that Membrane never is to be seen turgid or swelling with any serous or other dewy Humour, as he calls it.

The Membrane of the Muscles. XIX. *The Membrane common to the Muscles, is a thin Membrane cloathing all and every one of the Muscles, and separating them from themselves, and the adjacent parts.*

Riolanus, animadvert. in Bauhin. finds fault with *Bauhinus* for reckoning this Part in the number of the common Containing Parts; and yet in the mean time calls it a Membrane proper to the Muscles. But *Bauhinus*'s meaning may be easily interpreted for the best; That he reckon'd that Membrane among the common Containing Coverings, as it is proper only to the Muscles, but common nevertheless to all the Muscles, that is to say such a one as infolds, covers, and contains such and such Muscles only, but in the mean time is common to all the Muscles.

CHAP. V.

Of the Proper Containing Parts.

The Bones. I. *The Containing Parts proper to the lower Belly, are the Bones, Muscles of the* Abdomen, *and* Peritonæum, *or Membrane of the Paunch.*

II. *The Bones are few and large, that is, the Vertebers of the Loyns, the* Os Sacrum, *with the Crupper-bone adjoyn'd, the Huckle-bone, Hip-bone, and Share-bone; of which more* l. 9. c. 12.

Muscles. III. *The Muscles of the Paunch or* Abdomen *are ten, (sometimes eight, seldom nine) distinguish'd by their proper Membranes, and the running along or situation of the Fibres; on both sides equally opposite one to another.*

Oblique descending. IV. *The first Pair, which is External, is fram'd by the Oblique descending Muscles, full of obliquely descending Fibres also.*

These arise from the lower part of the sixth, seventh, eighth, ninth, tenth and eleventh

eleventh Ribs, before they end in Gristles folded among the Spires of the greater Saw-shap'd Muscle, and the transverse Processes of the *Vertebers* of the Loyns; sticking also to the side of the Hip-bone, and end with a broad Tendon in the middle of the Paunch at the *Linea Alba*. Which Tendon sticks so close to the Tendon of the next ascending Muscle, that it is almost inseparable from it, nor can be parted from it without being torn and dilacerated. Now its membranous *Tendon* begins at the *Linea Alba*, which *Spigelius* calls the *Similunar* or Halfmoon Line. These Tendons in Men (which also happens to the two other lower Pairs, the Ascending and Transverse) are crossed on both sides by the Processes of the *Peritonæum*, extending themselves to the Testicles; but in Women by the *Vermiform Ligaments* of the Womb; which Passage being overmuch widen'd or broken, if the Call or Intestines fall upon the Groin or Cod, it is the cause of Burstenness.

They derive Nerves, Arteries and Veins from the Intercostal Branches at the upper part.

The Linea Alba. V. *The* Linea Alba *is a whitish part running from the* Cartilago Mucronata *through the middle of the Paunch and Navil, to the* Os Pubis, *or Share-bone.*

It has the firm Substance of a Tendon, through the Concourse of the Ends of the Tendons of the Descending, Ascending, Transverse, and Pyramidical Muscles of the *Abdomen*.

It is broader above the Navil, narrower below it; and in Women with Child many times it appears of a blewish Colour; which Colour it has been known to keep till the third Month after Delivery.

Riolanus animad. in Bauhin. seems to believe it to be a peculiar Membrane running out from the *Cartilago Mucronata* of the Breast, through the Navil, to the Commissure or joyning of the Share-bone, and receiving the Tendons of the Share-bone. In the same *Animad. in Bauhin.* he affirms the *Linea Alba* to be imaginary; perhaps because that being blind through Age, he could no longer discern it.

Obliquely Ascending. VI. *The second Pair is constituted by the Muscles obliquely Ascending, furnish'd with Ascending Fibres, which as they ascend, cross the Descending in form of a Letter* X.

They arise from the Transverse Processes of the *Vertebers* of the Loyns (from whence they receive the Nerves) and the *Apophyses* or going forth of the *Os Sacrum*, (but membranous both,) and the outward fleshy part of the Hip-bone. Hence the fleshy Ascending are joyn'd at the top to the Cartilages of the eighth, ninth, tenth and eleventh Ribs, and terminate in the *Linea Alba* with a broad nervous Tendon crossing the right Muscles; and are nourish'd by the little Branches of the Arteries growing from the musculous Artery near the Loyns, and casting forth Veins to the musculous Vein.

Some Anatomists vulgarly hold, that these Muscles with a double Tendon enfold the right Muscles. Which is not very probable. For above, the Tendons of the Ascending Muscles rest upon the right Muscles, and are so fast interwoven with their Tendony Intersections, that they can hardly be separated whole from 'em. But in the lower or inner part of the Muscles those Tendons cannot be discover'd, and therefore they are deservedly rejected by *Vesalius*, and *Riolanus*; and *Laurentius* is justly blam'd by *Riolanus*, for taking notice of 'em in his Sculptures.

Musculi Recti. VII. *The third Pair is that of the* Musculi recti, *so call'd because of the streight Course of the Fibres.*

They are very strong, three or four fingers broad, and about a finger thick.

They arise fleshy from each side of the *Cartilago Mucronata*, the Breast-bone, and the Cartilages of the Ribs, (where they receive three or four Nerves from the Intercostal parts) and so descending directly down; and being united almost near the Navil, and distinguish'd with two, three, sometimes four Impressions, as it were into several Muscles, end at length with a strong, thick Tendon in the Share-bones. Some Anatomists describe their beginning from the Share-bones, and make 'em to end in the Cartilages of the Ribs. Others believe that they consist of several Muscles, and place their beginnings partly in the Cartilages of the Ribs, partly in the Share-bones, and make 'em to end at their Intersections, and affirm the several parts contained between the Tendon-like Inscriptions to be so many Muscles. To which Opinion, not improbable, *Spigelius* gives his consent, induc'd thereto by this Argument, Because they not only receive *Nerves* from the *Intercostals* above, but also below from the *first Pair* of the Loyns. For it is a perpetual Rule,

That

that every Muscle moves toward its beginning. But where the Nerve is inserted, there, as *Galen* testifies, is the beginning of the Muscle, (See the Reason *l.* 5. *c.* 1.) but here several Nerves are inserted into their Parts, not only above and below, but also those which are interspac'd with separate Intersections; and therefore there are many beginnings of these Muscles; which in regard they cannot be many in one Muscle, therefore all the *Musculi Recti* do not consist of one, but of *several Muscles*. Moreover if we consider their primary use, which is strongly to press down the Belly for the Expulsion of Ordure and the Birth; which Compression and Expulsion does not require that either the Breast-bone should be drawn downward, or the *Os Pubis* upward; but that those Bones should remain in their places, and that all and every the parts of these Muscles should swell together; that so the upper parts of every one should draw upward some parts that are neareſt to 'em at the first Intersections; the lower parts other parts which are neareſt to 'em, downwards; and that the middle parts, lying between the Intersections, should draw to themselves the parts that are next 'em on both sides.

Which Contractions being made by distinct and several Parts to several parts, (which cannot be done in one Muscle) it follows that every single *Musculus Rectus* must consist not of one, but of several Muscles.

VIII. *As they receive large Arteries from the Epigastrics ascending, and the Mammillary Arteries descending, so they send forth a larger sort of Veins to the Epigastric and Mammillary Veins.*

IX. *These Arteries and Veins at their Ends in the inner part, are vulgarly said to joyn together about the middle by* Anastomoses *one into another.* So that the Ends of the Epigastricks open into the Ends of the Mammillary Veins, whence many derive the Consent and Sympathy of the Dugs with the Womb. But I have always observed these *Anastomoses* or Openings of one Vein into another, to be wanting; nor did I ever yet meet with any Body wherein these Ends were not distant one from another, the breadth either of a Thumb or a little Finger, so that I am certain the Cause of that Consent can by no means proceed from hence.

Thus *Vesalius* likwise, *in Exam. Obs. Fallop.* writes, that he has observed that those Vessels are never so united, that it may be said, there is any Communication between 'em. *Bartholin* also *in dub. anat. de lact. Thorac. c.* 1. writes that he sought for these *Anastomoses* in a sound young Woman, kill'd six weeks after her Delivery, but could find none: rather that the Branches ascending and descending were about a fingers breadth distant one from another: yet *Riolanus* defends those *Anastomoses* most stiffly, *Anthropog. l.* 2. *c.* 8. and asserts that he had shewn 'em to a hundred of his Scholars. But for all that, I do not give so much credit to his words, as I do to my own eyes. Perhaps old *Riolanus* might be dimm-sighted at that time, and so perhaps might think he saw what was not to be seen. Of these *Anastomoses* see more *l.* 6. *c.* 3. *& l.* 7. *c.* 7.

X. *The fourth pair resting in the lower Place upon the* Musculi Recti, *are the Pyramidal Muscles, so call'd from their figure which is* Pyramidal; *but from their use* Succenturiati, *because they are thought to assist the* Musculi Recti *in their duty.* *The Pyramidal Muscles.*

They arise small and fleshy from the Share-bones, where they also receive the Nerves. From this larger foundation they rise smaller and smaller, and scarce four fingers broad, ascending the Ends of the *Musculi Recti*, yet somewhat unequal in length, the left being both shorter and narrower, they thrust their sharp Tendon into the *Linea Alba*, and sometimes extend it to the Navel with a slender End.

Vesalius. *Andernacus*, and *Columbus* describe those Ends erroneously for the beginning of the *Musculi Recti*, seeing that the interceding Membrane, and also the Separation which may be made without any prejudice to the *Musculi Recti*, also the Obliquity of the Fibres quite different from the strait Muscles, and lastly a peculiar way of thrusting themselves into the *Linea Alba*, clearly demonstrate that they are several and distinct Muscles.

XI. Fallopius *and* Riolanus *ascribe to these Muscles the Office or Action of compressing the Bladder, and promoting the Excretion of Urine, or the Act of making Water.* *Their Office.*

Nevertheless sometimes both these Muscles are wanting; sometimes the one, and sometimes the other, is lacking; but more frequently the Left than the Right, and then the broader and more fleshy End of the Right

Right ſupplies their place. We have ſeveral times ſhewn as well when they have been both to be ſeen, as when they have been defective, both in Publick and Private Exerciſes.

Tranſverſe Muſcles. XII. *The fifth Pair conſiſts of the Tranſverſe Muſcles, faſten'd to the* Peritonæum *underneath, and full of Tranſverſe Fibres.*

They begin from the Ligament riſing from the Tranſverſe Proceſſes of the Vertebers of the Loyns, the Huckle-bone, and the Cartilaginous Neighbourhood of the ſix inferiour Ribs. And being furniſh'd with Arteries, Veins and Nerves obliquely aſcending, they end with a large Tendon in the *Linea Alba*. To theſe the *Peritonæum* ſticks ſo cloſe, that it cannot be ſeparated from 'em without Dilaceration.

The Action of the Muſcles of the Abdomen. XIII. *The common Opinion is, that all the forementionʼd Muſcles compreſs the lower Belly, and by that means promote the diſperſing of the Nouriſhment through the Veſſels and Bowels, as alſo the expulſion of ſuperabundant Excrements, and the mature Birth, alſo that they aſſiſt the Breaſt in ſtrong Reſpiration, and Expectoration, or forcible throwing off what is offenſive to the Lungs, faſten the Containʼd Bowels, and defend 'em from External Injuries, and cheriſh 'em with their Heat.* But I think this, that it is convenient to diſcourſe ſomewhat more particularly of their Actions. For if generally they all ſerve to compreſs the Belly; which are they that raiſe the Containing Parts of this Belly? For their Elevation and Depreſſion is Alternate, and both are equally neceſſary to the puſhing and ſqueezing forward of the Nouriſhment and Humours through the Containʼd Parts, which I admire no Perſon has hitherto taken notice of. And therefore there is a notable Diſtinction to be made of the Operations of theſe Muſcles.

XIV. *In the firſt place the two oblique Pair raiſe the* Abdomen. For in regard they ſwell at their beginnings or fleſhy Part, then the Tendons with the *Linea Alba* draw outward and raiſe upward; and that ſame ſwelling uſually concurs with the ſwelling of the Dilating Muſcles of the Breaſt; and therefore in breathing, the *Abdomen* is alſo elevated together with the *Breaſt*, which every man may find in himſelf. Then again that Elevation may be made without breathing, when the Animal Spirits, eſpecially more copious, are determinʼd to theſe Oblique Muſcles, and very few flow into the dilating Muſcles of the Breaſt. This Operation alſo, among other things, their Oblique Situation teaches us; (which is not ſo convenient for preſſing forth;) as alſo their Original, and the length of their Tendons. But the other three *Pairs* manifeſtly ſerve for Compreſſion. For the *Muſculi Recti*, with the *Pyramidal*, when they ſwell, cannot but very forcibly depreſs the Belly; and the tranſverſe Muſcles ſwelling, becauſe they riſe from the Loyns, cannot but very ſtrongly contract the Belly, by drawing the *Linea Alba* backward.

Spigelius l. 4. anat. c. 10. aſcribes another Uſe to the Muſcles of the *Abdomen*, that is, to move the Trunk of the Body at the Sides Circularly and Obliquely, and to bend the Body forward. Of which two Offices, the one is to be aſcribed to the Oblique, the other to the Streight Muſcles.

Beſides the foreſaid Muſcles, thoſe Muſcles ſeated in the Region of the Loyns and *Oſſa Sacra*, may be reckon'd among the Muſcles of the Inferiour Belly: But becauſe that they are chiefly ſerviceable to the Action of other Parts, they are not muſter'd in the Order of the Muſcles of this Belly.

The Peritonæum. XV. *The moſt inward Containing Part of the* Abdomen *is the* Peritonæum, *by the Arabians call'd* Ziphach, *becauſe it is ſpread over all the Bowels of this Belly, and not only contains and reſtrains 'em, but clothes them with a Common Tunicle.*

Veſalius and *Bauhinus*, following the Opinion of *Galen, de uſu part. lib. 4. cap. 9.* aſcribe to it the Office of compreſſing the Inteſtines, and to the Excluſion of the Birth. But in regard that Action or Compreſſion is Voluntary, it is neceſſarily perform'd by the Muſcles, the Inſtruments of voluntary Motion, by which means the compreſs'd *Peritonæum* puſhes forward, and ſo preſſes forth only by Accident.

XVI. *It is a thin and ſoft Membrane, interwoven with Spermatic Fibres, ſmooth within-ſide, and as it were beſmear'd over with Moiſture, without fibrous and ſomewhat rough.*

XVII. *It is improperly ſaid to derive its Original from the firſt and ſecond* Vertebræ *of the Loyns, becauſe the*

the thickness of it is more in that place, and its Connexion firmer. I say *improperly*, because no one Spermatic Part derives it self from another, but all take their Original from the Seed. *Fallopius* is of Opinion that it has its beginning from the beginning of the *Mesentery*. *Lindan*, agreeing with *Riolanus*, deduces its beginning from the Membrane outwardly infolding the Vessels and the Bowels. But in regard this Membrane is rather to be taken from the *Peritonæum* that spreads it self over all the lower Belly, the *Peritonæum* can never derive its beginning from that.

Its Duplicity. XVIII. Jacobus Sylvius *observes it in men, to be thicker and stronger in the upper part of the Belly, in women toward the lower part of the Belly. Which* Bauhinus *believes so order'd by Nature in the one, as being more addicted to Gluttony; in the other, for the sake of the Womb, and the Birth to be therein conceived.* But *Spigelius* affirms it to be thicker in both Sexes always in the lower part, and never in the upper. Which he believes was so ordain'd by Nature with great Prudence, as being the Part which is most obnoxious to *Ruptures*; in regard that whether we sit, walk, or stand, the Bowels always weigh downwards; and therefore that the *Peritonæum* may be better enabled to sustain their weight, she thought it necessary to strengthen and fortifie that part.

Its Vessels. XIX. *It has very small Nerves that arise from the Vertebra's of the Breast and Loyns. Arteries and Veins that spring from the Diaphragmatic, Mammary, and Epigastric Vessels.*

XXI. *It is bor'd thorough at the passage of the Gullet and Vessels above and below, and proceeding outward in the Birth, as also of the Vermiform Ligaments of the Womb.* Moreover, its outward Membrane forms in men, two Oblong Processes, like more loose sort of Chanels descending toward the *Scrotum*, for the defence of the Testicles and Spermatic Vessels descending and turning again.

XXII. *This Membrane is call'd* Vaginalis, *the Sheath-Membrane, because it comprehends the Stones as it were in a Sheath.* But in Women, whose Stones are not pendulous without, it extends it self on both sides to the end of the *Round Ligaments* of the Womb; and proceeding forward, together with it, without the *Abdomen*, extends it self above the *Share-bones* to the *Clitores*. But its inner Membrane sticks fast, and grows to the Spermatic Vessels, or the foresaid Ligaments of the Womb, passing forward, and together with the *Vaginal Membrane*, extending without the Cavity of the *Abdomen*. For that Membrane being either dilated or broken in that place causes Bitterness; so that the *Intestine* and *Caul* in Men falls into the *Scrotum*; in Women down upon their *Groyns*. Which Rupture or Dilation of the *Peritonæum*, if it happen in the Navel, is call'd *Hernia Umbilicalis*, or the Navel-Rupture.

CHAP. VI.

Of the Parts Contain'd; and first of the Caul.

I. *THE Parts Contain'd in the* Abdomen, *either perform the publick Concoctions; or serve for the distribution of the Nourishment and Blood; or expel the Excrements, or serve for Generation.*

The Stomach, small Guts, Sweetbread, Liver, Spleen, and Caul (which is serviceable to them) perform the publick Duties of Concoction.

The Arteries, Veins, Milky and Lymphatic Vessels serve for the distribution of the Nourishment and Blood.

The thick Intestine, the Gall-bladder, the *Porus Biliarius*, the Kidneys, and the Urinary Bladder, expell the Excrements.

The Spermatic Vessels, the Stones, the *Parastatæ* or crooked Vessels at the back of the Testicles; the *Prostatæ* or Glandules under the Seminal Bladders, the Seminary Vessels, the Womans Privities, her Womb and Neck of the Womb contribute to Generation. But tho' in Men the Yard and Testicles are excluded out of the *Abdomen*, yet are they by *Anatomists* reckon'd among the Parts contain'd; because the *Spermatic* Vessels go forth toward the Testicles from the Internal Parts, and the different Vessels proceed from the Testicles toward the inner Vessels; and for that the Seed which is collected together in the inner *Prostatæ* and Seminary Vessels, flows out of the Yard.

Of all which we are to treat in the following Chapters according to their order.

II. *The* Peritonæum *being open'd, presently appear the Navel Vessels. Of which in the* 32. Chapter.

The Caul. III. *Those being remov'd, the Caul offers it self; in Latin* Omentum, *as it were* Operimentum, *because it covers the Bowels.* The Greeks call it *Epiploon*, for that it does, as it were, swim over the Guts; sometime *Gargamon*, sometimes *Sagena*, that is, a Net, or little Net; for that by reason of the straggling Course of its Vessels, it resembles a Fisher-man's Net: the Arabians call it *Zirbus*. It covers all the *Sanguineous* Parts; tho' it appears fatter over some, and more *membranous* over others.

The Description. IV. *It is a thin and double Membrane rumpled like a* Purse, *arising from the* Peritonæum *that infolds the outside of the Stomach and Colon.* *Riolanus* derives its *Original* from the *Mesentery:* Which Opinion differs not from the first, when the *Mesentery* has its Membranes from the *Peritonæum*; of which it is a certain sort of *Production.*

Its Substance and Connexion. V. *It consists of a thin Membrane interwoven with several folds, and small thred-like Fibres, growing in the forepart to the bottom of the Stomach and the Spleen, and sometime also to the round Lobb of the Liver, at the hinder part growing to the* Colon, *and so folded like a Sack; as also of several Vessels, and a soft kind of Fat, which is chiefly spread about the Vessels, and is very plentiful in fat People.*

Its Vessels. VI. *It has a world of Veins, which it transmits to those which run toward the Liver from the Stomach and Spleen, and so to the* Vena Porta, *or great Vein of the* Abdomen. *With which are intermix'd several Arteries from the Branches of the* Ramus Cœliacus *and Mesenterick Artery, and some few Nerves that proceed from the Plexures of the Intercostal Nerves of the sixth Pair.*

Its Interweaving. VII. *The Roots of the Blood-conveighing Vessels, meet one another here and there with an* Anastomoses, *leaving conspicuous Spaces between each other, which are also fill'd themselves with smaller Branches, springing sidelong from the larger Roots, by means of whose frequent Conjunction an apparent Net is form'd, whose middle Spaces exhibit various Figures fram'd with wonderful Art and Workmanship.* Many of these lesser Branches also run out into the Fat, and not only thrust themselves slightly into the outermost Lumps, but also penetrate farther in, and are fasten'd to the Lumps or little Globes of Fat: and sometimes they are hid with a small thin Membrane spread over 'em, so that they are imperceptible. *Malpigius Exercit. de Oment. ping. & Adip.* exactly describes the Structure of the Caul, in an *Ox*, a *Sheep*, a *Hart*, a *Dog*, and some *other Animals.*

The Glandules. VIII. Vesslingius *asserts, that several little Kernels, plain to be seen, sometimes more, sometimes fewer, are scattered up and down in the said Vessels.* But *Riolanus animad. in Vesling. & Barthol.* affirms that he never observed any such Kernels. But through Age he seems to have forgot a truer Assertion in *Anthropogr.* where he acknowledges some few. And indeed they are very few, and those only under the lower and deeper Part, under the *Pylorus*, or right Orifice of the Ventricle, and the Spleen.

In like manner *Wharton*, in his *Adenographia* makes mention of but very few. For *c.* 12. he writes, *That he only found two little Kernels, but those always in the Caul. One bigger in the place where it joyns with the* Pylorus; which he observ'd receiv'd some few *milkie Vessels* running from the bottom of the Stomach toward the length of the Caul (but he is in an Error, for there are not any *milkie Veins* that derive themselves from the bottom of the Stomach, but as far as I could find by three or four Observations, these Vessels do not seem to be milkie, and advancing to the Kernel, but rather *Lymphatic*, and proceeding out of the Kernel.) These Vessels, the same Author says that afterwards, *viz.* from the length of the *Caul* they run with an oblique Course toward the right Extremitie of the Sweetbread, which they partly seem to creep under, and partly glide by, tending toward the common Receptacle of the *Chylus*, into which they disburthen themselves. *The other Kernel he asserts to be a little less*, which he affirms to have found sometimes double, sometimes treble, sometimes consisting of more Bodies. But if many Kernels are found in any Body that was sickly, at his Death, he calls those Kernels Adventitious, because they are not to be found in healthy Bodys.

IX. *The*

Corpora adipoſa.

IX. *The learned* Malpigius, *beſides the aforeſaid Veſſels, obſerves other very thin and ſlender Bodies, extended like ſmall Threads, among the Veſſels that ſhoot forth, which he calls* Corpora adipoſa, *or fat Bodys:* and he believes 'em to be certain peculiar hollow Veſſels, carrying the materials of Fat for the Generation of Fat, tho' it be impoſſible to obſerve their Original, by reaſon of their extream Slenderneſs. In the mean time he is of Opinion that theſe Materials of Fat are ſeparated from the Blood by the means of certain inviſible *adipous Kernels*, and are ſo ſent to theſe Veſſels, and thro' thoſe conveighed into the Membranes, there to be coagulated into Fat. For as there are certain peculiar Kernels appointed for the ſeparation of Acid, Salt, Bitter, Lympid, *&c.* Humors, from the Blood (for this ſhall be made out in the following Chapter) ſo he believes that there muſt be certain peculiar Kernels (which he calls *Adipous*) of neceſſity appointed of oily and fat Particles from the Blood; and that thoſe oily Particles being ſeparated, are to be carried through certain peculiar adipous Veſſels, in the ſame manner as the Blood, the Animal Spirits, the *Chylus*, and lympid Humor, called *Lympha*, are carryed through peculiar Veſſels; upon which he introduces many ingenious and probable Conjectures. But what it is that makes me queſtion the Truth of theſe Kernels and *Adipous* Veſſels, I have already ſet down in the fourth Chapter preceding; where I have made mention of theſe Kernels.

Its Situation.

X. *The Caul is ſeated about the Inteſtines, into whoſe Windings and Turnings it inſinuates it ſelf, and ſpreads a great part of its ſelf between the Spleen and the Stomach.*

The Bigneſs.

XI. *In many Perſons it ſcarcely extends it ſelf below the Region of the Navel, in ſome farther, reaching even to the Bladder, and ſometimes in fat Women compreſſing the Mouth of the Womb* (to the bottom of which it rarely grows) it occaſions Barrenneſs, as *Hippocrates* teſtifies: And in Men if it fall down through the torn *Peritonæum* into the *Scrotum*, it cauſes that Rupture which is called *Epiploce*, when the Caul falls into the outward Skin of the Cods. It appears in more Folds and Doubles toward the Spleen than in any other Parts. Sometimes in Women after Delivery, remaining all rumpled about the middle of the Belly, it occaſions terrible and frequently returning Pains.

The Weight.

XII. *For the moſt part, in Men grown up, it hardly exceeds the weight of half a Pound; and yet ſometimes it has bin known to weigh ſeveral Pounds.* Thus it is found to be wonderfully encreaſed in ſome Diſeaſes: And *Wharton* relates that in a Virgin that dy'd of a *Cachexie*, he ſaw a Caul that was fleſhy, or rather *Glandulous*; about half a Thumb thick. Sometimes alſo in fat and tun-belly'd People that are ſound, it is covered over with a great quantity of Fat, which encreaſes its weight. Thus *Veſalius l.* 5. *c.* 4. ſaw a Caul, which being augmented to the weight of four or five Pounds, drew down the Stomach with its Ponderoſity, and was the Occaſion of the Parties Death by its weight.

Its Uſe.

XIII. *By cheriſhing the Heat of the Stomach and Guts, it cauſes more ſucceſsful and ſpeedier Concoctions. It ſupports the ſplenick Branch, and other Veſſels tending to the Stomach*, Colon, *and* Duodenum. Moreover it many times receives the Impurities and Dreggs of the Liver, as appears out of *Hippocrates*, *l.* 7. 55. alſo out of his 4. *lib. de Morb. & lib.* 1. *de Morb. Mulier.* As alſo from the Obſervations of *Riolanus*, *Roſſetus*, and other *Phyſicians.*

CHAP. VII.

Of the Ventricle, Hunger, and the Chylus.

The Stomach.

I. *TAke off the Caul, and preſently the Ventricle or Stomach appears; as it were a little Belly, call'd by the Greeks* Κοιλία, *as alſo* Gaſter.

Definition.

II. *It is an organic Part of the lower Belly, ſeated in the* Epigaſtrion, *next under the* Diaphragma, *which receives the Nouriſhment taken, prepared by Maſtication, and let down through the Gullet, and there concocts it; and diſſolving the beſt part of the Nutritive Subſtance, converts it into a* Chylus *or whitiſh kind of Subſtance, like to Cream.*

Membranes. III. *It consists of a triple Membrane; the outermost thick and common, springing from the* Peritonæum, *the middle, fleshy, the innermost, full of Wrinkles, and covered over with a viscous Crustiness, to preserve it from the Injuries of Acid Juices.*

Fibres. IV. *In the middle and innermost Membrane, in the first place, there is to be seen great Variety of Fibres extended, some obliquely, some streight, and some Circular: For the strengthening of the Bowels, and more easy Retention and Expulsion.*

The inner Tunicle. V. *The innermost Tunicle is vulgarly said to be common to the Gullet and* Oesophagus; *whereas it is of a far different Nature and Structure, and in regard of its Temper and Composition, contains a most admirable fermenting Quality, which the Membrane of the Mouth of the Stomach and* Oesophagus *is not indued withal*; and hence it engenders and stores up within it self a peculiar Fermentative Humor; which being in a sound Condition, the Concoctions of the Stomach are rightly perform'd, but being vitiated by the Mixture of Choler, or any other depraved Humors, occasion a bad Concoction. And therefore it would be better to say that this Tunicle is not common with, but continuous to the *Oesophagus* and Mouth of the Stomach. For there is a great Difference between *Continuitie* and *Communitie*. For the one denotes only the inseparable Adhesion of the Substance alone; but the other signifys the Equality both of Faculties and Uses. For Example, the great Arterie, is continuous to the Heart, but not common, as not having such Qualities and Actions as the Heart has.

Temperament. VI. *The Temperament of the Stomach is moderately Hot, not so hot as the Heart, Liver, and many other Parts.* Which moderate Heat is augmented and cherished by the Heat of the Parts that lie round about it: To the end the Concoction of the Chylus may be the better accomplished; which otherwise is greatly endammaged by the Excesses of these Parts either in Heat or Cold.

The Number. VII. *In a Man there is but one Stomach: It being a rare thing to find two Stomachs in any Body:* Of which I never read but three Observations; of which one concerning a Stomach divided into two, is cited out of *Joselinus* by *Theod Schenkius*, *in Anat.* The other is cited by the same Person out of the Observations of *Salmuthus*: And the Third is set down by *Riolanus*, *Anthropogr. l. 2. c. 20.* in these Words. *Once I saw a double Stomach continu'd, but distinguished with a narrow Mouth in a Woman publickly dissected in the Year 1624. In this Woman the Stomach was oblong, narrow in the Middle, equalling the Gut Colon in Breadth and Largeness. Which being dissected, I found that narrow Part, being like the* Pylorus, *to end in another large Cavity, which afterwards terminated in a thicker Orifice, which was the real* Pylorus, *from whence, as an* Ecphysis, *the first Intestine took its beginning.* Beside these three Examples, I do not remember that ever I read any thing farther upon this Subject. But there are two Stomachs in Animals that chew the Cud, and many other Animals, that feed upon harder and raw Nourishment; also in Birds that cast up their Meat out of their Stomachs to feed their Young ones. And then the First by the Latins was called *Ingluvies*, or the *Crap:* Which is more Membrany and Thinner, the other more Thick and Fleshy. And in the First the Matter seems to be prepared for concocting, the Second to be perfectly Concocted. It is said that in some Creatures three Stomachs have bin found; and *Riolanus* testifys, that four have bin found in those Creatures, which chewing the Cud have Teeth only in one Jaw.

Figure. VIII. *The Shape of the Stomach is Oblong, Gibbous toward the right Part, and slenderer toward the Right.*

Situation. IX. *It rests upon the Back-Bone near the first Verteber of the Loyns, and with the left Part, which is rounder and bigger, giving way to the Liver, it hangs forward toward the left Side: The left Side being the slenderer, and covered with the left Lobe of the Liver, and supported by the Sweetbread, is joyned to the* Duodenum, *or first of the small Guts.*

The Bigness. X. *The Bigness varies according to the Diversity of Ages and bigness of Bodys; to the Proportion of which it ought to answer; tho' that be no certain and perpetual Rule.* For I have dissected several tall Men, who have had very small Stomachs, and several Men of a short Stature, that have had

had large Ventricles. Gluttons, Voracious, or Greedy People, have generally large Stomachs. Such was that, which *Schenkius anat. l.* 1. *Sect.* 2. *c.* 14. affirms that he saw in a great Glutton that held ten Quarts of Wine. That was also a large one, mentioned by *Spigelius Anat. l.* 8. *c.* 8. that contain'd fourteen Pints of Liquor: Which was found in a Man that had a large Mouth. Whence *Bauhinus Anat. l.* 1. *c.* 46. believes that a Man may judge of the bigness of the Stomach from the largeness of the Mouth: And that such as have a wide Mouth, have a large Stomach, and are Voracious: Which is also the Opinion of *Spigelius*. But neither is that Rule without Exception: For I remember that *Falcoburgius*, a certain famous Anatomist of *Leiden*, cut up before us, in the publick Theater, the Body of a very tall strong Man, who in his Life time had bin a stout drinker, and a great Eater, and always Healthy until he came to be hanged against his Will, in whom we saw so small a Stomach, that it hardly amounted to half the bigness of an ordinary Mans Stomach: But trebly exceeded other Ventricles in thickness.

The Bottom. XI. *It is distinguished into the Bottom or Cavity (the one the lower or greatest Part, inclining to the left Side, with its chiefest and largest Part, where the first Concoction is finished) and two Orifices, the Right and Left.*

The Stomach. XII. *The left Orifice, commonly called the upper Orifice, is that which is properly the Stomach, and Continuous to the* Gullet *and* Diaphragma, *about the eleventh* Verteber *of the Breast, over against the* Cartilago Mucronata, *admits the swallowed Nourishment.* This, exceeding the other in Bigness, thickness, and Largeness, is interwoven with many orbicular Fibres, somewhat fleshy (which cause its more firm Contraction, and in the various Postures of the Body lying down, hinders the Nourishment from falling back into the Mouth) and Nerves from the sixth Pair; and in that is the natural Heat of the Appetite, according to the vulgar Opinion: Not that the Act of *Desiring* is there performed, which is only in the Brain, but that through the Intervals there is such a Cause in it, the Trouble of which being perceiv'd in the Brain, stirs up such an Act of *Desiring*.

The Pylorus. XIII. *The other Orifice, which is the Lower, properly called* Pylorus, *or the Door-keeper, is narrower than the other, somewhat bow'd toward the Back Bone, on the left Side, full of Fibres thwarting one another, having a thicker Circle, and shap'd like an Orbicular Muscle (by means of which it detains the Nourishment for some time, lest it should slip away too soon, and undigested) and continuous to the* Duodenum *Gut, send the concocted Nourishment to the Bowels.* Which Nourishment does not pass by a steep Fall, as lying equally high with the Stomach, but ascends before Expulsion.

The Vessels. XIV. *The Ventricle receives Nerves, Arteries, and Veins.*

Its Nerves. XV. *It receives* Nerves *from the sixth Pair. For that both the Trunks of the wandering Pair, below the* Ramus pneumonicus, *descending along the Sides of the* Oesophagus, *is divided into two Branches, the External and Internal.* Of these, the External by and by joyn together again, and embody into one Nerve, and spreads it self over the upper part of the Ventricle with many Shoots. The Internal also running together, make one Nerve, which descending along the *Oesophagus*, and the external part of the Stomach, encompass the bottom of the Ventricle, and sends into it a great number of *Fibres*. Through these Nerves the Animal Spirits flow in great Quantity into the Ventricle, contributing to it a quick Sense of Feeling: Which because of the larger Quantity of Nerves dispersed into the Stomach, becomes more sensible in the upper Part than the lower, which is thought to be the cause of Hunger. Through these Nerves of the wandering Pair is infused into the Fibres of the Ventricle, a natural Power of Contracting themselves, in all Expulsions, of what ever is contained in the Ventricle: And by means of them also is that great Consent between the Ventricle and the Brain.

Its Arteries. XVI. *It receives its Arteries from the* Cœliac Arterie, *which serve to carry the Alimentary Blood with which it is nourished.*

Its Veins. XVII. *It is sprinkl'd with several Branches of small Veins sculking among its Tunicles, many of which meeting*

meeting here and there, and closing together, they form at length four more remarkable Veins, which run to the *Porta Vein*, that is the 1. *Gastrick*, which is bigger than the rest, 2. and 3. the right and left *Gastroëpiploid*, 4. and the *Pyloric* Branch: Also another Vein, called the *Vas breve*, or *Vas Venosum* (which issues forth from the Ventricle sometimes with one, sometimes with two, sometimes three, and sometimes more Branches, to be inserted into the *Spleen Branch*. By these the remainder of the Blood, which is left after the Nourishment of the Stomach is conveighed to the Liver.

Vas breve.

It carrys nothing from the Spleen to the Ventricle.

XVIII. *Formerly Physicians asserted that there was a certain acid Juice or Blood, which ascended into the Ventricle through the* Vas breve, *for the Nourishment of it, as also to create an Appetite, and stir up Hunger in the Ventricle. But the very Sight it self demonstrates the Falsehood of this Doctrine in the Dissections of living Animals, in which it is apparent that there is nothing flows from the Spleen to the Ventricle; but that the Blood continually flows from the Ventricle to the splenic Branch:* For upon tying the *Vas breve*, there will presently appear a Swelling between the Ventricle and the Ligature; but a shrinking of the Vessels between the Ligature and the *splenetic Branch*. Which is a certain Sign that the Blood flows as we have said; and that it hardly reaches the Spleen (for the Entrance of the *Vas breve* into the splenetic Vein, for the most part, is somwhat distant from the Spleen) nor does it enter into the Spleen, but is poured forth into the *splenetic Branch*, and flows from thence directly to the *Porta*. More of this Matter may be seen in the following *16. Chapter.*

The Triangular Space.

XIX. *Here we are to note by the way, that some learned Men are very trivial in their Exposition of the* 54. *Aphorism of* Hippocrates l. 7. where he says, *They who have any Flegm included between the Ventricle and Diaphragma, are troubled with Pain, because the Flegm has no Passage to either Belly,* &c. Induc'd by these Words, they assert, That between the left Sde of the Ventricle and the *Diaphragma*, there is a large *Triangular Cavitie*, fenc'd about with Membranes proceeding as well from the *Ventricle*, as from the *Diaphragma* and *Caul*, which nevertheless is a gross Mistake: For that there are no Membranes sent from those Parts that meet in that place, neither is there any such Cavity form'd there. Indeed sometimes a Portion of the Caul insinuates it self between the *Diaphragma* and the hinder part of the *Ventricle*, so that sometimes it counterfeits the swelling of the Spleen. And this is that without all doubt, which has deceived the Patrons of the said Opinion, not being well versed in *Anatomie.*

It is unreasonable.

XX. *The Ventricle, tho' it be not a principal Part, yet is it an assistant and serviceable Part;* To which we are chiefly beholding for the Preparation of the Nourishment (whence *Quintus Serenus*, a *Sammic Poet*, calls it the King of the Body.

They on Truths Royal Basis seem to stand,
Who give the Stomach the Supreme Command:
If it be Strong, it gives Strength, Vigor too,
To other Parts: If weak, their Overthrow.

Wounds of the Stomach mortal.

And therefore all Diseases that assault it are to be accounted very dangerous; and the Wounds which it receives are by *Hippocrates*, 6. *Aphor.* 17. deservedly accounted Mortal; because the membranous Vessels are hard to be cur'd in that part: and if they happen about the Stomach, by reason of the great number of Nerves intermingled in those places, they kill the Patient with continual Convulsions and Hichups: but if they light upon the lower part, the swallow'd Nourishment presently falls through the Holes into the Cavity of the *Abdomen*, where in a short time they rot the other Bowels with their Corruption and Putrefaction. However tho' Use and Reason confirms that saying of *Hippocrates*, yet this Rule sometimes, tho' not frequently, admits an Exception; for it has been known that some Wounds of the Ventricle have been cur'd. And of such Cures we find Examples set down by *Fallopius de cap. Vuln. c.* 12. *Cornax in Epist. Julius Alexandrinus Annot. ad l. 6. c.* 4. *Therapeut. Galen. Schenkius* also collects other Stories from others, *Observat. l.* 3. Such a Cure I observ'd in the Month of *December* 1641. in a Country Lad, who in upper *Holland* was wounded with the Stab of a Penknife in the right side of the *Ventricle*; the wound being of an indifferent size, so that for eight days together we saw all his Meat and

A rare Observation.

and Drink came out again at the Orifice, especially if you did but press the lower part of the Ventricle with your hand: Which Efflux of his Nourishment stopped for seven days, but then return'd again for three days, and no more; nor did the Nourishment discharge it self so much as it did before. Afterwards being ordered to lye upon his right side day and night, nothing more flow'd out; so that no other Disease happening, and the Surgeon following his Cure, the Patient, beyond mine and the Expectation of all Men, within six or seven weeks was perfectly cur'd. Nor did he afterwards feel the effect of any detriment which the wound had left behind, nor any hurt done to his Stomach. But,

More miraculous are those Accidents concerning two Knife-swallowers, of which the first is related by *Bernard. Suevus, Tract. de Inspect. Vulner. Crollius in Præfat. Basilic. Sennertus Prax. lib.* 1. *part.* 1. *Sect.* 1. *c.* 15. and several others, of a *Bohemian* Country-man, who in the Year 1602. at *Prague*, swallowed a Knife nine Inches long; which Knife, after it had lain seven weeks, was at length cut out of his Stomach, and the Patient perfectly cur'd.

The other Accident *George Lothus* and *Roger Hempsing* relate, as seen by themselves, in a particular part of *Germany*, of a young Man of two and twenty years of Age, who at *Regiomont* in *Prussia*, in the Month of *May* 1635. swallowed a Knife by chance, the breadth of two hands in length, the smooth Haft slipping down unawares. Which Knife was cut out of his Stomach six weeks after, and the Patient perfectly cur'd in a Month. This Knife was afterwards given by *Daniel Becker*, a Physician of *Dantzick*, to *Otho Heurnius* then Professor of *Physic* and *Anatomy* at *Leyden*, where it is still preserved among other Rarities in the Anatomy-Theatre.

That Stones grow in the Ventricle.

XXI. *That Stones do grow in the Kidneys and Bladder, is a thing frequently known, and sadly experienced; and that Stones have been also found in the Liver, Lungs, and several other parts, is that which the Observations of Physicians testifie: but that they should breed in the Stomach, is a thing hardly ever heard of; and yet* Bauschius *gives us four Examples of it.* Ephemerid. Med. Phys. Tom. 2. Observ. 181. The first out of *James Dolis Zenki*, who reports, That a certain Woman, after long Pains in her Stomach, vomited up two Stones about the bigness each of an Almond, and was presently freed from her Gripes. The second out of *Laurentius Scholtzius*, who writes, That a certain Person, long tormented with cruel pain in his Stomach, at length vomited up a very large, oblong, and hard Stone, upon which his pain ceased. The third out of the same Author, of a Woman who at forty years of Age was troubled with a Pain and Swelling of her Stomach, want of Appetite, and continual Reaching; In whose Stomach, after she was dead, were found as many Stones as a man could well hold in the hollow of his hand, which being long kept, moulder'd away, and crumbl'd into a kind of yellow Salt: He adds a fourth Example of Count *George* of *Oppendorf*, in whose Stomach were also found several little Stones.

Its Action.

XXII. *The Action of the Stomach is to make the* Chylus, *that is, to extract a Milkie Juice by peculiar Concoction out of the several Nourishments, which is call'd the* Chyle.

The Chyle.

XXIII. *The* Chyle *is a Milkie Juice like the Cream of a* Ptisan, *prepar'd and concocted out of the Nourishment received into the Stomach.*

The manner of Concoction.

XXIV. *The Nourishment or Food is concocted in the Stomach by way of Fermentation; by which means they dissolve, and so the Juice is extracted out of 'em.*

Fermentation twofold.

XXV. *Fermentation is twofold. One whereby the Particles of the Mixture are stirr'd about of themselves, grow warm, and are rarify'd; and by dissolving the Salt which binds 'em together, they are so separated, that they become more full of Spirits: and are then for the greatest part mixed together again, and tho' more full of Spirits, yet remain mix'd.* The other, *which is by many call'd* Effervescency, *is that by which the Acid Particles of the Salt, for the greatest part, boyling together with some Watry and Tartarous Matter, are concenter'd by Coagulation, and so are separated from other Particles of the Mixture, that they never return to an exact Union and Mixture with 'em again.*

XXVI.

XXVI. *After the first Manner Fermentation causes Chylification*: tho' in our following Discourses, when we design to express a vehement Fermentation, we shall make use of the word *Effervescency*.

The manner of Fermentation.

XXVII. *This Fermentation is made when the Salt parts of the swallow'd Food, are by the heat of the Stomach, and the acid Juice, dissolv'd, melted, and become full of Spirits, and withal corrode and move about the Sulphurous Particles, and so after a kind of Combat forsaking the strict Chains of their Mixture*, are expanded and shaken somewhat sowre and sharper as they are, through the thicker Mass, together with the sulphury spiritous Particles jogg'd together in like manner, and because of their passage deny'd, and mixture of the thicker Matter not yet fully dissolv'd, being driven back again, they assail that Mass with motion upon motion, and divide and expand the smallest Particles of it one from another, and dispose 'em to a more easie separation, and to receive the form of another Pap-like and Milkie Mixture. But as for what Particles cannot be sufficiently dissolv'd by this Fermentation, or reduc'd to a Milkie Substance, they become Excrement, whose separation from the Milkie Juice is wrought in the Guts.

The force of Fermentation.

XXVIII. *This fermentative Concoction (which is finish'd without any vehement Motion upward or downward, or any tumultuous Agitation through the Cavity of the Ventricle, as happens in Water boyling over the Fire) is so violent, that by the force of it the hardest Meats, which can hardly be mollified with a whole days boyling over a Kitchin-fire, in a few hours are not only soften'd, but so dissolv'd and melted, that the Particles being forc'd from their friendly Union, and torn one from another, and mix'd with the Liquor either inherent or infus'd into the Stomach, they are turn'd into a Pap-like Consistency, not unlike to the Cream of a* Ptisan.

The reason of Chylification.

XXIX. *Now that the Food is rather turn'd into* Chyle, *than into Choler, Blood, or any other Humour, that is to be attributed to the peculiar Quality of the Substance of the Ventricle, or to the Specific Temper and peculiar Structure, and consequently to the Specific Ferment and manner of Fermentation*; as the peculiar Quality of the Liver and Spleen produces another Ferment, and as Blood is made in the Heart. However it is not done by the fermentative Particles alive, which are mix'd with the swallow'd Food, nor by a moderate Heat, as some are of Opinion. For they only conduce to the dissolution of the Nourishment, but the moderate Heat to promote the said Concoction or Fermentation, and excite the absconding Power to Action. But why that Concoction and Dissolution produces the *Chylus*, rather than any other Humour, that is to be attributed to the peculiar Quality of the Substance, there is no other Reason to be given for that, but only the peculiar Quality of the Substance, in respect of which, the Heat operates otherwise in the Stomach, than in the Heart or any other part; and there disposes of the Ferment after another manner than in any other Bowel. Thus as the Kitchin-fire mollifies one way by Boyling, another way by Roasting, another way, that which is Fry'd in Butter, or otherwise, that which is prepar'd in Vinegar or Pickle, and that by reason of the Substances by which, and upon which that soft'ning is to be brought to pass: Thus the Heat of our Body, by reason of the proper disposition of the Ventricle, and the Juices therein contain'd and bred, therefore otherwise soften and dissolve the Nourishment in the Stomach than the other parts, and dispose the Ferment after another manner, to inable that Ferment to dissolve and concoct the swallow'd Nourishment, in a distinct manner from the Reconcoction in other parts of the Nourishment already melted and dissolv'd for second Concoction. So that by reason of this peculiar Quality, while the Stomach is sane, and acts according to Nature, there can be no other Juice there made than a white *Chyle*.

XXX. Paracelsus *writes that* Archæus *with his Mechanic Spirits could perfect Chylification in the Stomach: but by* Archæus *he means the innate Heat.* To this Opinion *Riolanus* seems to adhere *in Not. ad Epist. Wallæi.* Nevertheless he admits something of a shadow of a peculiar Quality, in these words: *I attribute the Cause to the diversity of the innate Heat, in the manner of the Substance, that is*, saith he, *the property of the innate Heat.* Not that the innate Heat differs of it self in Sub-

Substance. But when it cannot subsist without a Body or Substance without it self, it must operate variously according to the diversity of that Substance in the several parts.

XXXI. *Hence it is apparent,* how frivolous that is which some assert, *That the Ventricle does not make the* Chyle, *but is only an Instrument and Receptacle where the* Chyle *is made; and that it no otherwise makes the* Chyle *than the Pot wherein the Meat is boyl'd makes the Broth.* But I would fain know who is so blind as not to see, that when *Chylification* is attributed to the *Stomach*, we do not mean the bare Membranes of the *Ventricle*, but a live and sound Ventricle that is furnish'd with its own Spirit and Heat, and a Convenient proper Ferment generated out of the peculiar Quality of its own Substance, with none of which things a Porridge Pot can be said to be endued.

The Colour of the Chyle.

XXXII. *The Colour of the* Chyle *is Milkie and somewhat white, by reason of the sulphury Particles, dissolv'd with the salt ones, and mix'd with the acid Ferment of the Stomach.* For every Liquor impregnated with Sulphur and a Volatile Salt, or a Salt admirably well dissolv'd, presently turns to a kind of Milk, if any thing of acid Moisture be pour'd upon it. Which is prov'd sufficiently by the preparations of Sulphur, and the Extracts of Vegetable Rosins. Also Spirit of Hartshorn or Soot, being sprinkled with any liquid Juice, or only fair Water, presently turns to a kind of Milk.

Whether it may be red.

XXXIII. Plempius *and* Walæus *are of Opinion that the* Chylus *is not always white; but that from red Nourishment it becomes red, from green, green.* But herein they mistake; for were it not white of it self, it never would be found always white in the Milky Vessels of the *Mesentery* and Breast; but we should also meet with red, green, or any other Colour, which was never yet observ'd by any Person. True it is, that frequently it appears sometimes more, sometimes less serous and thin, in the pectoral Chanel of the *Chylus*, according as there is more or less of the Lymphatic Juice, which flows in great quantity from all parts into the *Chyle-bearing* Bag; which Limpid Juice, when there is no *Chyle*, continually and leisurely flows alone through that Chanel; nevertheless the *Chyle* that appears in those Milky ways, is never seen to be of any other Colour than white.

XXXIV. *Therefore tho' the whitish Colour of it may be something darken'd in the Ventricle and Intestins by many other thick Particles of the Nourishment tinctur'd with green, red, or any other Colour, and intermix'd with it, in such a manner that the Mixture cannot be discern'd, it does not thence follow, that the* Chylus *of it self has any other Colour than white.* For tho' in green Herbs the white, or rather pellucid Colour of the spirituous and watery Parts be not apparent to the sight, it follows not from thence, that the spiritous and watry part of those Herbs is of a green Colour; for if the separation be made by distillation, it presently appears pellucid. And so it is with the *Chylus*, for being separated from the Mass which is tinctur'd with any more cloudy Colour, mix'd with the acid Ferment of the *Pancreas* or Sweetbread, it never appears of any other Colour than white.

XXXV. *But because Chylification cannot go forward unless the Nourishment be swallowed into the Stomach, it will not be amiss, before we prosecute any farther the History of Chylification, first to inquire into the cause of Hunger,* that so we may more easily attain to the more perfect knowledge of *Chylification.*

What is Hunger.

XXXVI. *What Hunger is there is no man but can readily give an account, that is to say, a desire of Food.*

But what it is that provokes that desire, and is the occasion of it, has been variously disputed among the Philosophers.

Whether from sucking.

XXXVII. *Anciently they held that it proceeded from the attraction or sucking of the emptied Parts; and that the first emptied Parts suck'd it from the Veins, the Veins from the Liver, the Liver from the Stomach endu'd with a peculiar sucking Quality; which act of sucking they thought occasioned that trouble which we call Hunger. But this Opinion is now adays utterly exploded.* First, for that according to this Opinion plethoric Persons would never be hungry: Secondly, because there can be no such attraction by the emptied Parts through the Veins

from the Liver, by reaſon of the little Lappets or Folding-doors that hinder it.

Whether from an acid Juice.

XXXVIII. *Others obſerving that acid things create Hunger, believ'd it to be occaſion'd by the acid Juices, carried from the Spleen through the* Vas breve *to the Ventricle.* But this Opinion Modern *Anatomy* more curious has utterly deſtroy'd, demonſtrating in living Animals, that the Blood deſcends through that Veſſel from the Stomach toward the Spleen, and ſo empties it ſelf into the Splenic Branch, but that nothing flows a contrary Courſe from the Spleen to the Stomach.

Whether from the Juices of the Arteries.

XXXIX. *Many there are, of which number* Regius, *who affirms that Hunger is occaſion'd by the biting of the emptied Ventricle, by certain ſharp and hot Juices, continually forc'd through the Arteries into the Ventricle or its Tunicles, which after the Expulſion of the* Chylus, *not knowing what to gnaw upon, prick the Ventricle, whereby the Nerve of the ſixth Pair, being mov'd within it after a certain manner, excites an Imagination of taking Nouriſhment for the relief of that pricking.* But this Opinion is from hence confuted, for that the Blood of the Arteries, by reaſon of the Dominion of the Sulphury Particles, is by no means ſowre, but ſmooth, ſoft and ſweet; ſo that it neither does, nor can cauſe any troubleſome pricking or corroſion, neither in the Tunicles of the Ventricle, nor of any other Parts, tho' of moſt exquiſite Senſe (as the Adnate or Conjunctive Tunicle of the Eye, the Nut of the Yard, *&c.*) Beſides, it would hence follow, That by how much the more of this Arterious Blood is thruſt forward to the emptied Stomach, ſo much the more hungry a man would be: but the Contrary is apparent in burning Fevers, that ſuch as in health have faſted two days together, are no more a hungry, whereas their Stomach is clearly emptied, and the Blood continually flowing through the Arteries into the Stomach. Then if Hunger ſhould be provok'd by that Corroſion, why does not that hungry Corroſion happen in ſuch People?

A Story.

We were about forty of us one time travelling together, in our Return out of *France*, at what time being becalm'd at Sea, ſo that there was a neceſſity for us to tarry longer than we expected, all our Proviſion, Water and other Drink being near ſpent, ſo that at length we were conſtrain'd to faſt the third day, not having a crumb of Bread nor a draught of Drink to help our ſelves: but after we had faſted half a day, or a little more, there was not one that perceiv'd himſelf a hungry; ſo that the third day was no other way troubleſome to us, but that it weak'ned us, and made us faint: Neither did the Arterious Blood occaſion any hungry Corroſion in our empty Stomachs. And thus not only Reaſon, but alſo Experience, utterly overthrows the aforeſaid Opinion. And therefore *Ludovicus de la Forge* vainly invents a way for this *Arterious* fermentative Liquor from the Arteries to the Stomach, *in Annot. ad Carteſii lib. de Hom.* where, ſaith he, *It may be here queſtion'd, why that Liquor* (i. e. the Fermentative) *is carried through the Arteries to the Stomach and Ventricle, rather than to other Parts. To which I anſwer, That the Arteries conveigh it equally to all Parts, but the Pores of all the Membranes are not ſo convenient to give it paſſage, as the Pores of the Ventricle.* Now that this feign'd Subterfuge is of no moment, appears from hence, That in the Membranes of the Brain, and many others, whoſe Pores are ſo convenient, that the Blood may be able to flow in greater quantity through them, than is convey'd to the Stomach; yet there is neither any Corroſion or Vellication of the Part. Some, that they may defend this Corroſion the better, ſay That the Blood which is conveighed, or flows to the Stomach, is ſharper than that which is conveighed to any other Part. But this no way coheres with Truth, becauſe all the Blood is one and the ſame which is ſent out of the Heart to all the Parts of the whole Body; nor is there any thing to ſeparate the ſharp from the milder Particles, or thruſts 'em forward to theſe, rather than to thoſe Parts.

The true Cauſe.

XL. *Others laſtly, to whoſe Opinion we think fit to ſubſcribe, aſſert that Hunger is occaſioned by certain acid fermentative Particles, bred out of the Spittle ſwallowed down, and ſome others ſomewhat Salt or indigeſted Acids, adhering to the Tunicles of the Ventricle, and by that drawn to ſome kind of Acidity; or remaining in it after the Expulſion of the* Chylus, *ſtitching to the inner wrinkl'd*

wrinkl'd Membrane (especially about the upper Orifice) and a Vellication, troublesome to the Stomach, which being communicated by the Nerves of the sixth Pair to the Brain, thereby an Imagination of Eating is excited, to appease the troublesom Corrosion.

XLI. *This Acrimonie is infused into those fermentative Particles by the Stomach, when the sulphurous Parts are jumbl'd in the Juices that stick to the inner* Tunicle, *and the Salts are melted by the convenient Heat of the Ventricle to a degree of Fusion, and so they turn Acid after a Specific Manner.* To which purpose the swallowed Spittle descending to the Stomach may be very prevalent (for this hath a fermentative Quality in it self, as we shall shew ye *l.* 3. *c.* 24.) and to the same effect may also conduce the subacid *Pancreatic*, or Sweetbread Juice being infused into the *Duodenum*, if any Part of it shall rise toward the Stomach, or shall transmit any acid Vapors or Exhalations from the Intestin to it.

An Objection. XLII. *Here some Object, and say, if this be the Cause of Hunger, then when the Stomach is full, and Concoction and Fermentation are both busily employ'd, Men would be most Hungry; for then many more acid and fermentaceous Particles are called forth to their Work, which must of Necessity pull and tear the Ventricle much more than the few before mentioned.* 'Tis deny'd. For the Particles to be fermented and fermented, that is dissolv'd, will be more; but not the *Fermentaceous*, or Particles dissolving. Of which we have an Example in Leven'd Bread, whose single Parts have no power to ferment another Mass of Flower; because the acid Particles are no longer predominant, but the Sulphureous, as appears by the sweetness of the tast: And so long as that prevalency of the sulphury Particles continues in the dissolv'd Particles, so long they cannot become Acid or *Fermentaceous* (for Sulphur is Sweet.) As appears in *Fevers*, wherein acid Medicins are generally most plentifully prescrib'd, for the subduing of the sulphury Predominancy: And restoring the convenient fermentaceous Quality. For when the Prevalency of the sulphureous Particles is overpowered by the Force of the salt Acids, then comes the fermentaceous Acidity to be introduc'd. So that there are not more acid, sharp, and corroding Particles in the full Ventricle concocting the Food; or if there be, they are so stain'd by the copious Liquor intermixt, so that they can occasion no troublesom Vellication to the Stomach; by which means the Hunger cannot be greater at that time, but rather ceases altogether. But when the *Chylus*, and with that the dissolv'd sulphureous Particles intermixt with the salt are gone off to the Intestins, then the Remainder that sticks to the inner Tunicle of the Ventricle, or is carried thither with the spittly Juice, as being freed for the most part from the redundancy of sulphurous Particles, grows sowre through the heat of the Ventricle, and so begins to tear again, and renews the Appetite, which ceases again, when that Acidity comes to be retemper'd by the Meat and Drink thrown into the Stomach, and its Acrimony comes to be mitigated and blunted.

XLIII. *But if these fermentaceous Juices are not only not moderated in the Stomach, but that through some defect of the Liver, Sweetbread, or other Parts, over sharp Humors are too abundantly bred in the Body; or flow from the Head, or some inferior Parts, into the Stomach, in so great a Quantity, that their Acrimonie cannot be sufficiently tam'd and temper'd by the swallowed Food, then happens that preternatural Hunger which we call* Canine; *with which they who are troubl'd, often vomit up undigested Meat together with sowre Juices like the Juice of Limon (as they themselves confess) and by reason of the gnawing Acrimony, occasioned by the extream viscousness of the Humors remaining in the Ventricle, presently become hungry again and fall to eat.* *Canine Appetite* But if the fermentaceous Particles are in themselves very viscous, or thicker, and of a slower Motion, then they require a longer time to elevate themselves and excite Hunger; which chiefly happens when the acid Spirits less abound in the whole Body, and consequently in the Spittle, and that viscous Humor that sticks to the inner Tunicle of the Stomach.

XLIV. *Sometimes also it happens that Hunger is frequently diminished, when bitter Choler ascends in too great Quantity into the Stomach (as*

in cholerick Men, in the Jaundise, and several sorts of Fevers) *and therein by its Mixture corrupts not only the fermentaceous Relicks of the Nourishment remaining in the Stomach after the Expulsion of the* Chyle, *but also the Spittle that flows to it.* The more remote Causes of lessening the Appetite are various, as excess of Sleep and Laziness, excess of Care, and looseness of the Belly, *&c.* Overmuch Sleep, and too much sitting still, for that for want of sufficient Exercise of the Body, the Humors also are not sufficiently stirr'd; nor are the acid Particles conveniently separated from the Viscous, so that they cannot be sufficiently roused up to Action. In extraordinary Cares of the Mind hunger is not perceiv'd, because the Thoughts are otherwise employ'd. And as for looseness of the Belly, 'tis a certain Truth that the Ferment is vitiated.

The Ferment.

XLV. *Now these fermentaceous Particles that excite Hunger, as appears by what has bin said, are acid, or somewhat acid, and are the same that promote the Concoction of the Stomach, and ferment and dissolve the swallowed Nourishment.* Hence it is, that Acids moderately taken increase the Appetite, and cause a better Concoction of the Stomach. Of which we have an Experiment (besides our daily Experience in our Seamen, who make long Voyages to the *Indies*. For having fed upon thick and hard Meats for a long time, hence it comes to pass that their Appetites are deprav'd, and their Concoctions but weak; which breeds a Scorbutic ill Habit of Body. But when they come to Islands or Countries where they meet with plenty of Limons, and other acid Fruits, presently their Appetite is restored, and all the concoctive Faculties, that languished before, are renewed, together with their Strength, through the said acidity, and so in a short time they recover their former Health. Therefore to keep the Seamen in Health in those long and tedious Voyages, the Masters of Vessels are wont to carry along with 'em a certain Quantity of Citron Juice, which they distribute now and then among the Mariners, when they find their Stomachs begin to fail 'em.

XLVI. *Acid therefore are those fermentaceous Particles which excite Hunger; which if they be wanting in the Stomach, the Appetite fails, nor can the Chylification be perfected, but the Meat is thrown off into the Bowels raw and unconcocted as when it was first swallowed down:* But they being again restored to the Stomach, the Concoction returns, and the Appetite is restored. Hence says *Hippocrates 6. Aph.* 1. *In long Fluxes of the Belly, if sowre Belches happen, it is a good Sign.*

XLVII. *Now how it comes to pass that the fermentaceous Particles obtain that embased Acrimony, has bin already said, by an apt Heat melting those salt Particles to a degree of being Liquid and ready to flow.* I say, *Apt.* For as Bread becomes well leavened in a luke warm Place by the Ferment mixed with it, in a cold Place in great difficulty, but in a hot Oven can never be fermented: So this Acidity which will not be excited but by a moderate Heat of the Stomach, will not be stirr'd by too small a Heat, and is scattered and dispelled by too great a Heat; and thereby those Juices that should make the Ferment will be quite consum'd. Hence *Flegmatic People* that are troubled with a cold Distemper of the Stomach, have neither good Appetites nor good Concoctions; and *Choleric Persons*, who are infested with an over-hot Temper of the Stomach, have none at all. However it does not follow from this, that the greater the Heat of the Stomach is, the quicker must be the Appetite, and the stronger and better the Concoction: For the contrary appears in burning Feavers, and an Inflammation of the Stomach: As also in a *Lyon*, whether he be accounted the hottest of all Creatures, yet can he not digest *Iron*, *Gold*, *Brass*, or the like; which however are easily digested in the Stomach of an *Estriche*, as being endued with a sharper Ferment, tho' not with so fervent a Heat. As *Langius* relates that he saw at the Duke of *Ferrara*'s Court an *Estriche* both swallow and digest those Metals, *l.* 1. *Epist.* 12.

XLVIII. *Therefore it is not the Heat but the Ferment, which in some is more sharp and acid, in others more moderate, which is the next Cause of the Appetite and Digestion of the Stomach:* But moderate Heat is the Cause which disposes the Matter which begets that Ferment that elevates and excites to Action.

What is the chylifying Heat.

XLIX. *But whereas this Power and Vertue in the Stomach of making this*

this Ferment, and of Chylifying by its Assistance, cannot be excited into Action but by an apt and moderate Heat, some there are who question what, or rather where this Heat lies that produces this Action. Whether it be the Heat of the Membranes of the Ventricle, or the Parts that ly round it, or of any Humor, or any Spirits. Certainly there is no difference of this Heat in the diversity of Subjects, in relation to self; for all Heat is excited by the Motion and Agitation of the least Particles and subtil Matter (for because the Heat is fiercer in red hot Iron, slacker in the Flame of Straw; this does not argue the difference of the Heat it self, but of the Quantity, proceeding from the diversity of the Subject to which it is inherent) But the Diversity of Operations proceeds from the diversity of the things themselves, upon which, and by virtue of which the Heat acts. For the same Heat melts Wax, hardens Clay, wasts the Meat upon the Spit, bakes it in the Oven, and boyls in the Pot, putrifys in a Dunghil, and hatches Eggs in a Stove, without the assistance of a Hen. In like manner to promote the Act of Chylification, it is required that the moderate Heat (which is no more than one and the same, should be proportionably adapted in the Stomach; that is, both in its Membranes, its Humours and Spirits, and that it should be cherished and foster'd in like manner by the Heat of the Parts that lie round about it; for so being truly and aptly proportion'd, it is impossible but the Ventricle must act properly and naturally toward the Chylification of proper Matter, by dissolving and extracting a *Chylus* out of it.

The manner of Chylification.

L. *The Preparation of Nourishment for Chylification proceeds gradually after a certain kind of Method.* For first the Spittle is mixed with the Meat which is chewed and masticated in the Mouth, not only softning them, but infusing into them, a fermentative Quality (of which Quality see *l.* 3. *c.* 6. & 24.) then comes Drink, Ale, Wine, or any other Liquor, which for the most part contains in it self acid Particles and fermentaceous Spirits. This Nourishment the Stomach strictly embraces, and squeezes it self round about it by the help of its Fibres, and mingles with it the Specific fermentaceous Juices, as well those bred in the interior Tunicle, as those that are affused upon the Spittle. Then by an apt and proper Heat there is a Mixture and Liquation or Melting of the whole Substance of the Nourishment together. For that the fermentaceous Particles sliding into the Pores of the Nourishment, withal get into their very Particles themselves, stir about, melt and dissolve the more pure from the thick, and render 'em more fluid, to the end they may be able to endure another form of Mixture, and be united among themselves into the form of a milky Cream. Which being done, by the squeezing of the Ventricle they fall down to the Intestins together with the thicker Mass with which they are intermixt; in them to be separated by the mixture of Choler and the pancreatick or Juice, after another manner of Fermentation, and so to be thrust down to the milky Vessels.

The time for Chylification.

LI. *The certain Time for the finishing of Chylification cannot be determined.* For here is great Variety observed proceeding from the variety of the Temperament of the Stomach, Age, Sex, Position, and Disposition of the Parts adjoyning, and the Nature of the Nourishment themselves.

LII. *But why some Meats are digested sooner, some later; the Reason is to be given from the variety of the Meats themselves in Substance, Hardness, Solidness, Thickness, Thinness, Heat, Cold, &c.* For which reason some are dissolved with more ease and sooner, some with more Difficulty and later in the Stomach. But then again, why the same Meats are in others sooner in others later concocted; and wherefore some Stomachs will easily concoct raw Fish, hard Flesh, half boyl'd, or tho' it be raw, but the Stomachs of others will with great Difficulty the tenderest and best prepared Dyet; this proceeds from the various Constitution of the Stomach, the Ferment, and the proportion of Heat.

LIII. *What I speak of Meats, the same is to be understood of Drinks: Which for the same Reasons, and because of the same Varieties, are digested in others well, in others ill, in others sooner, in others later; and render the Digestions of the Stomach, in others better, in others worse.* For Example; if Wine or any other Liquor be drank plentifully, that is either quickly digested, by reason of the great

great Plenty, Thinneſs, and Spirituoſity of acid Particles, and ſo flows down to the Inteſtines; or elſe by reaſon of the extraordinary Quantity, being very heavy and troubleſome to the Stomach, is thruſt forth raw and undigeſted; of which Crudity the ſigns are ſowre Belches, Vomiting, Rumbling in the Guts, and Crude Urines.

LIV. *If fair Water be drank which contains no acid Particles, in a hotter Stomach, or where ſharp and hot Humours abound, there it uſes to temper, and ſomewhat to ſuppreſs an exceſſive and ſtinking Fermentation: but in a colder Stomach, and full of cold Juices, it hinders Digeſtion.* For that by its cold Moiſture it dulls the ſharp fermentaceous Particles contain'd in the Stomach, and the Meat receiv'd; that is, by its intermix'd and plentiful Aquoſity it breaks to pieces and ſeparates the leaſt Particles of the active Principles at too great a diſtance one from another, ſo that they cannot act with a mutual and ſufficient activity one upon another, ſo that then there happens a leſſer Motion, and for want of that the more cold ariſes, ſo that the fermentaceous Particles cannot be ſufficiently attenuated by the heat of the Stomach, nor elevated to a juſt degree of Effervеſcency; and then they become unable to act upon the Particles that are to be fermented.

Fat things abate hunger.

LV. *Note alſo that fat Meats too plentifully eaten abate hunger, and render the Chylifying Concoction more difficult; becauſe they dull the Acrimony of the fermentaceous Particles:* or rather becauſe they ſo involve the chiefeſt part of the Particles of the Nouriſhment receiv'd, that the ſharp fermentaceous Particles cannot act with conveniency upon 'em; which efficacy of Fat is to be ſeen in External Things. For *Silver* or *Pewter* Veſſels being ſmear'd over with *Fat*, are not to be corroded by ſharp *Vinegar* infus'd, tho' the *Vinegar* retain all its Acrimony. Neither will *Aqua fortis* corrode the Skin if well greas'd over. Thus the ſharp fermentaceous Matter acts with very great difficulty upon Meats that are over fat; which is the reaſon that the eating of too much Fat occaſions vomiting. See more of Ferment, *c.* 17. & *l.* 2. *c.* 12.

LVI. Ludovicus de Bills, *a kind of a paradoxical Anatomiſt is ſaid to have obſerv'd the Time of Chylification in the diſſection of Dogs, after this manner, according to the Report of* N. Zas. If a Dog be fed with only ſweet Milk, then the Chylification will be perfected about two hours after: Mix white Bread with that Milk, it will be three hours, or ſomewhat leſs, before the Chylification will be perfected. If the Milk be thicken'd with Barly Meal, and ſo eaten by the Dog, it will be four hours before the *Chylus* will appear in the Stomach: But feed the Dog with white Bread only, and it will require ſix hours to perfect the *Chylus*.

But theſe Obſervations of *Bills* are very uncertain; for that all the Stomachs of Dogs are not of the ſame Conſtitution, nor in the ſame Condition of Sanity, nor digeſt their Meat in an equal ſpace of Time; thence it will come to paſs, that Digeſtion which ſhall be accompliſh'd in the Ventricle of one within an hour, ſhall not be finiſh'd in another in two or three hours, though it be of the ſame Meat. Moreover, unleſs theſe Obſervations be meant of all ſorts of Concoctions of Nouriſhment received by the Stomach, they will contradict both Reaſon and Experience, which will teach us that neither in Men nor Dogs, all Meats that are ſwallow'd into the Stomach, are digeſted together, nor are all their apt and agreeing Particles turn'd into *Chyle*; all at a time, the thinner firſt, the thicker afterwards, ſo that there can be no certain time prefix'd for *Chylification*. For Milk being eaten with Bread, tho' perhaps it requires three hours, before all the apt Particles ſhall be turn'd into *Chylus*; yet will it not be three hours before ſome *Chyle* be produced out of it; for the thinner Particles of the Milk will be ſooner turn'd into *Chyle*, which will be conſpicuous after one, ſometimes in half an hour, and ſometimes ſooner, while the Bread and thicker Particles of the Milk ſhall remain to the third hour in the Ventricle. He then who affirms that the *Chylification* is not perfected before the end of the third hour, is in an Errour, for the very firſt hour a good part of it was perfected and finiſh'd.

LVII. Bernard Swalve *in querel. & opprob. Ventric. elegantly deſcribes the time of Chylification, and the Obſtacles that may happen to hinder it.* Where he introduces the Stomach thus ſpeaking:

The Impediments and Time of Chylification.

All things that are receiv'd do not equally reſiſt my Labour. One gives way ſooner than another. Upon Milk meats I ſpend but

but an hour; not full two upon Pot-herbs. Nor does the softness of Fish require that time. Food made of Flower, as Bread and Crust, I can hardly dissolve into Cream in four hours; and the harder the Flesh is, the longer and more diligently must I labour. Mutton and Beef require seven hours to tame their Contumacy. Here I stand in need of a greater quantity of Acids, and a greater resort and assistance of Spirits. Now my Substance operates more strongly, and then all these things are frequently weaken'd and dispoil'd of their force. I omit to mention many things that disturb my Office, and hinder me in my duty, now this, now that, which puts me into a languishing Condition. For this is my misery, hence my tears, that I cannot resist the Invasion of External Injuries, and that I am expos'd to so many and so great Errours and Mistakes that obstruct me in my Employment. These Mischiefs are so fruitful, that I cannot always obtain my End in Digestion.

The Order of Chylification.

LVIII. *Assuredly these things are very well and succinctly described by* Swalve, *for that many and several sorts of Food being eaten at one Meal, do not all together, and at one equal distance of time, suddenly part with their Milkie Juice; but according to the greater or lesser force of the Stomach, and the fermenting acid Juice, and the difference of Food in Substance, Quantity, Quality, Hardness, Viscosity, Thinness, Solidity,* &c. The more spirituous and thinner Parts in some are sooner, in others later dissolv'd, and turn into *Chyle*; and they which are first digested, pass first through the *Pylore* or Orifice, the other remaining a longer time in the Stomach, till a more accurate dissolution. This proceeding is manifest from the Refreshment after the Meal; For the strength of Nature is soon repair'd, whereas the Meat is easily perceiv'd to remain in the Stomach. Which first Refreshment is caused by the thinner Particles of the Nourishment first dissolv'd and concocted, and already discharg'd by the Stomach. Which, should they remain in the Stomach till the absolute Concoction of the harder Masses, by that over-long stay they would be too much digested, and so become corrupted, or vitiated at least. And this Method is evident in the dissection of Dogs, kill'd presently after they have fill'd their Bellies. For generally in their Bowels and chyliferous or milkie Vessels, there is found a thinner sort of *Chyle*, which we have many times shewn to the Spectators in a sufficient Quantity, scarce an hour or two after they had eaten: especially if they fed upon a more juicy sort of Meats, when the chiefest part of the Food, not being yet turn'd into *Chyle*, still remain'd in the Ventricle.

The Order of Meats.

LIX. *Hence appears the mistake of many Physicians, who thought that the Nourishment which was first eaten was first discharg'd out of the Stomach; those things which were last eaten were last parted with.* And hence they have been very careful to prescribe an Order in Feeding; as, to eat those things which are of easie Concoction first, and those things which are hard of Digestion last, for fear of begetting Crudities through a preposterous Order in Feeding; according to the Admonitions of *Fernelius* 3. *de Sympt. Caus. c.* 1. 5. *Pathol. c.* 3. *Mercurialis* 3. *Prax. c.* 12. *Sennertus* 3. *Prax. part.* 1. *Sect.* 2. *c.* 9. and of many others. Certainly whatever Variety is received into the Stomach is confus'd, mix'd, and jumbled together, and that by Fermentation, by which the spiritous and thin Particles spread themselves, and free themselves from the dissolv'd thicker Substances, and so the thick being stirr'd and agitated together with the thin; by that motion there is made a Mixture of all together; of all which Mass, that which is sufficiently digested passes through the *Pylorus*, that which requires farther Concoction, remains of a harder Substance in the Stomach.

LX. *Here three hard Questions are to be examined in their Order. First,* Whether if Hunger be occasion'd by the acid fermentaceous Particles, creating a troublesome Vellication in the Stomach, what is the Cause of that which is call'd *Pica*, or a deprav'd Appetite (as when People long for Chalk, Oatmeal, Lime, and the like.) *Secondly,* Whether in a *Dyspepsie* (or difficulty of Digestion and Fermentation in the Guts) Choler can be bred in the Stomach, such as is evacuated upward and downward in the Disease call'd *Cholera. Thirdly,* Whether the whole *Chyle*, when concocted on the Stomach, fall into the Intestines.

LXI. *As to the first, The Cause of a deprav'd Appetite* (*call'd* Pica *and* Malacia) *seems to us not to have been by any person sufficiently explain'd; when as the affect it self is a thing to be admir'd, in regard the force of it*

is

is such, especially in Virgins and Women (for men are seldom troubled with it) that they will often with a wonderful desire covet Meal, Chalk, Tobacco-pipes, Dirt, Coals, Lime, Tarr, raw Flesh, Fruits, and other strange things altogether unfit for Nourishment; as live Fish, the fleshy and brawny part of the Members of a living Man, and Stones, (as *Sennertus* reports that he knew a Woman that swallowed every day two pound of a Grindstone, till she had at length devour'd it all) besides several other Precedents cited by Physicians, and what daily occurs to our Observation. Now they generally affirm the Cause of this Mischief to be the deprav'd Humours contain'd in the Ventricle, which, according to their various Natures, excite in some a various Appetite to this, in others to that, whether bad or good: in some, to dissimilar noxious things, in others to similar, as the vitious Humours according to their different qualifications variously tear & move the little Fibres of the Nerves of the Ventricle, by the peculiar Motion of which communicated to the Brain, there arises the same Motion in an instant in the Brain, by which a peculiar Appetite is stirred up to this or that thing. *Francis de le Boe Sylvius Prax. l. 1. c. 2.* as also in the *Dictates of the Private Colledge* assembled in the Year 1660. going about to explain this thing more particularly, asserts that the Cause of this deprav'd Appetite is a vitious Ferment of the Stomach, corrupted either by the vitious Nourishment, Physic, or Poyson, swallow'd down; or by several Diseases, especially such as are incident to Women, infecting the whole Mass of Blood, then the Spittle, and lastly the Ferment of the Ventricle, and disposing 'em to an ill habit. But if this formal Reason be of any force, let us from thence also ask this Question, Why such an Appetite, coveting this unusual Dyet, is also to be found in those who are troubled with no vitious Humours in the Stomach, as I have sometimes found by Experience; tho' I cannot deny but that there may be now and then for all that some ill Humours in the Stomach? Wherefore in a Man, whose Ferment and Ventricle are without fault, meerly upon the wistful looking upon some Picture, sometimes of Fish, sometimes of Fruits, or other things not fit for Dyet, shall find himself to have a strong Stomach for these things? in the same manner as the looking upon the Picture of a naked *Venus* excites many Men to Venery? What, and of what sort must be the Nature and admirable Quality that must so move the little Fibres of the Nerves and the Brain, that by reason of that special Motion there must be an Appetite to Grindstones, Tobacco-pipes, Coals, *&c.* which there is no body but knows can never be desir'd as a remedy against that troublesome gnawing, or as necessary for Nourishment.

LXII. *And therefore these things must proceed from some other Cause, that is to say, from the Mistake of the Imagination, and thence a deprav'd Judgment arising from an ill habit of the Brain, and a vitious Motion of the Spirits; and not from the pravity of the Humours in the Stomach.* For according as the vitious Humours augment or diminish the Vellication of the Fibres more or less intensly, it may increase or abate the Appetite, but not direct it to a particular choice of Dyet, especially such a one as is unnatural. For Hunger is a natural Instinct, by which Nature is barely excited to receive Nourishment, as a remedy for the gnawing, but not more especially to this or that Food, or to this or that Dyet, if it may be so call'd, as being altogether unnatural.

LXIII. *Then as for that which is said, That sound healthy People being a hungry, covet sometimes Fish, sometimes Flesh, sometimes Fruit, now roasted, now boyl'd,* &c. *This proceeds not from any peculiar Vellication or Gnawing, but from an Animal Appetite, which judges that sometimes such sort of Meats, sometimes another, sometimes sweet, sometimes sowre, will be more grateful and proper for the Stomach*; and therefore sometimes they covet more eagerly Wormwood-wine, raw Herrings, and several other things of themselves ungrateful, than others more pleasing to the Palate, and more wholesome.

LXIV. *Now since the Choice or Refusal of Meat, or of any thing else, depends upon the Judgment, and Judgment proceeds from the Brain, certainly the Cause of coveting this or that peculiar thing, is not to be sought for in the Stomach but in the Brain*; which if it be out of order, through bad Humours, and ill Vapours arising from any filth gathered together in the Womb, Spleen, or Sweetbread, and hence ascending

scending up to the Brain, easily occasions deprav'd Imaginations, whence follows a deep deprav'd Judgment, and through the mistake of that Judgment, noxious and absurd things are coveted, rather than the best and most wholsome, as Chalk, Coals, *&c.* (A thing well known to happen to melancholly People, who many times doat upon one particular thing, tho' in other things their Judgment is sound enough.) For how far Intent and frequent Cogitation upon a thing avails to increase such a deprav'd Appetite, is apparent in Women with Child, who many times long to that degree, that if they cannot get what they desire, the Child shall carry the Mark of the thing long'd for. Which impression cannot be said to proceed from any deprav'd Humours of the Stomach, but from the Brain; for that the Imagination being intense upon those things, and Judgment made upon their use, and Benefit proceeds from thence, and the Ideas of those things are conveigh'd from thence, and imprinted upon the Birth by the Animal Spirits. Besides, they that are troubled with a deprav'd Appetite, do not always long for one and the same thing, but sometimes for one thing, sometimes another, as their Fancies are fix'd more upon one thing than another, which cannot be imputed to any ill Humour adhering to the Ventricle; for that then the longing for variety of things must proceed from the variety of Humours. Besides, these sort of Patients are troubled with a deprav'd Appetite when they are a hungry, and then they most eagerly long for those things which they have thought of before, whether good or bad; and believe 'em then not to be bad or hurtful, but pleasing and wholesom. Which Depravation of the Appetite I have cur'd more by Cunning than by Physic; enjoyning the People of the House never to mention in the hearing of the Patients those hurtful things, and to remove all sorts of Pictures out of their sight; and in the mean time to feed 'em with wholesom Dyet, and that often in the Day, to prevent their being much an hungry.

An Objection.

LXV. *There is one Objection remains, that is to say, If a deprav'd Appetite were not caus'd by the ill habit of the Stomach, the Patients would be sick upon the eating such kind of noxious Dyet, neither would such things be digested in the Stomach; but on the other side, it appears that few or none suffer any harm by it, without doubt because there are those deprav'd Juices in the Stomach, which are able to digest that preternatural Dyet, which the Stomach seems to have particularly requir'd, as a remedy for that peculiar Vellication or Twitching of the Nerves.* But the force of this Objection is easily answer'd, when it is consider'd that it is not absolutely true, that such Patients receive no Dammage from such incongruous and preternatural Dyet, and that it is only true in very few, and that only once, twice, or thrice, but that afterwards they are cruelly afflicted by it, contracting Oppilations of the Bowels, the Dropsie, the wild Scab or Maunge, call'd *Psora*; and several other Distempers. But the reason why they receive no Dammage at first, is twofold.

First, Because upon the eager devouring of these things the Animal Spirits flow in great Plenty to the *Stomach* (as upon Venereal thoughts they flow in great abundance to the Generating Parts; together with a great quantity of Arterious Blood. Now how effectually these Natural Spirits operate in nourishing the Body, we shall explain more at large, *l.* 3. *c.* 11. and how far they conduce to the Concoctions of the Stomach, if they flow into it more plentifully than is usual, is apparent in those Slaves to their Bellies, that waste whole days and nights in thinking what they shall eat, and are always stuffing their Guts. For they, by reason of the plentiful Spirits design'd for the Stomach, have much swifter and better Concoctions, than such as are always busi'd at their Studies, whose Animal Spirits are call'd another way; and therefore are frequently troubled with Crudities, and hardly are able to digest the lightest Food.

Secondly, Because they that are troubled with a deprav'd Appetite, are for the most part melancholy; or such as breed more sowre fermentaceous Juices, are more sharp and copious than usual, in the Spleen, Sweatbread and Ventricle; whence when they begin to be a hungry, they have a sharper Stomach, and far more easily digest whatever they eat, than others; nay, than they themselves can do at another time. Thus I have known a Woman with Child, that longing for ripe Cherries, has at one time eaten up six or seven pound together; another that has eaten thirty Cheesecakes; and another that would eat raw salt Herrings and digest 'em well, when

at other times they did not use to be so greedy. And hence it comes to pass, that at such a time they will digest a large quantity of Meat, or those preternatural Things (as Oatemeal, Chalk, and Coals) or at least the Stomach discharges 'em without any harm. But if they continue that immoderate Course of Dyet, that sharper Juice at length failing, it becomes such a Disturbance to the Bowels and Stomach, that their Concoctions are thereby plainly interrupted and deprav'd, to the breeding of copious bad Juices, that increase a great quantity of ill Humors, which is the cause of several Distempers. From all which I think it is sufficiently manifest, that a deprav'd Appetite does not primarily proceed from any deprav'd Humors bred in the Stomach, or sticking to it, but from some defect of the Brain, and mistake of the Imagination.

Whether Choler be generated in the Stomach.

LXVI. *The second Problem is affirm'd by* Regius, *and several other Physicians, altho' it be far from being true. For in a crazy Condition of Health, the Humors in the Stomach may be corrupted several ways, and many bad ones may be gathered together, and yet never any Choler bred therein.* And for that which is exonerated upwards and downwards in the Disease called *Cholera*, that is not bred in the Stomach but in the Liver, collected and amassed together in the Bladder of the Gall, the *Porus Biliarius*, and other places adjoyning; from whence, sharply or sowerly fermenting and boyling, it bursts forth at last, with great Violence, into the *Duodenum*, and by virtue of that Motion is discharged and thrust out partly upward, through the Stomach, partly downward through the rest of the Intestines. Which is sufficiently apparent from hence, in regard that the Invasions of Choler are subitane, no Signs preceeding of any ill Affection of the Ventricle, or of any Choler bred or gathered togethet within it; and for that often when People have made a good Meal, not feeling any Disturbance either in the Appetite, or in Digestion, it overflows in their Sleep at Midnight, and sometimes in the day time, without any foregoing Notice; which certainly could not but precede, if a copious quantity of Choler, the Cause of the Disaster, were bred in the Stomach, or gathered there together. Neither will Reason permit us to believe, that Nature has constituted various and several Organs to perform one and the same Office, such as is the Generation of Choler. For to obtain that End, she makes use only of one sort of Means; and thus the Stomach alone Chylifys, the Liver alone breeds Choler, (*a*) the Heart only breeds Blood, *&c.* Nor does the usual Subterfuge avail in this place; that Choler generated in the Stomach, is not natural, but preternatural Choler. For to this I answer, that that Choler, which the Distemper, call'd *Cholera*, (which Choler, they say, is bred in the Stomach) and in the Looseneses of many Infants is discharged in great quantity, is a sharp, and for the most part eruginous or green Choler; I have found it to be such in the dissected Bodys of many that have dy'd of this Distemper, heaped up together in great Quantity in the Gall-Bladder, and the *ductus Cholodichus*; but little or none in the Stomach. Which is a certain Sign, that this *Choler*, when it is in a boyling Condition, breaks forth into the Stomach and Intestines, but that it is not bred there.

(a) *To wit that serous or lymphatick Juice, of which Choler, by means of the Fermentum in the Gall-Bladder is bred. See more hereof in* Synopsis Medicinæ, l. 4. c. 8. Sect. 10. § 14. ad 36. Salmon.

LXVII. *In Infants that have dy'd of such a green choleric Looseness, I have observ'd, and that frequently, the Gall-bladders full of very green Choler, and swell'd to the bigness of a large Hens Egg. So that it is most certain that where the natural, there the preternatural Choler is bred; that is to say, on the Liver.* * But some will say, that it is impossible that so great a quantity of green Choler should be so suddenly bred in the Liver, or be collected and stir'd up from any other Part within it, as uses to be evacuated in the Disease called *Cholera*, in a few Hours: For in the space of four and twenty Hours, several Pints of that Matter are evacuated, to the filling of some Chamberpots, and therefore of necessity it must be true, that that Choler is at that time bred in the Stomach. To which I answer, That this Choler being gathered together from all Parts to fill the Gall Bladder, for the most part is of a dark green Color, and very sharp, and when this, being in a boyling Condition, breaks forth into the Intestines and Ventricle, then it vexes and tears those Parts, and like a violently pricking Medicin, causes the Serous, and various other Humors, to flow from all Parts to the Intestines. Which being tinctur'd by a small quantity of green Choler infused into the Ventricle and Intestins, become all of a green Colour and so are discharged green out of the Body:

* *This is to be understood in the Sense before expressed, as we have hinted in the Margin of the former Paragraph.* Salmon.

Body: Which Redundancy of flowing Humors being sometimes very great, the Ignorant believe that it is only meer Choler that is expel'd the Body in such a great Quantity, when they are only other Humors coloured by the Cholet. Now that this Choler causes such a Tincture by its Intermixture, I know by Experience; for that with half a Spoonful of that Juice taken out of the Gall-bagg, I have, in the sight of several People, tinctured a whole Pint of Water.

Whether part of the Chylus be carried to the Spleen?

LXVIII. *The affirmative Patrons of the third Problem, with whom* Regius *consents, assure us that all the* Chylus *does not flow from the Stomach to the Intestins, but that some Part of it is conveighed to the Spleen, through the* Vas venosum breve, *and other neighbouring* Gastric Veins. For Proof of which they give a two fold Reason. *The first is,* because the Birth in the Womb is nourished first of all with the milky Juice that swims at the top of it, and through the Navel-vein sticking to it, and not as yet extended to the *Placenta*, conveighed to the Liver and Heart of the Infant. Now if this happen to the *Embryo*; 'tis no wonder that when a Man is born, that part of the Chylus should pass thro' the Gastric Veins to the Spleen. The *other* Reason is, that after a Man has fed heartily, there follows such a sudden Refection, that so great and so sudden could never happen, if the whole Chylus were first to pass through all the milky Vessels; and that some part of it did not rather get to the Spleen by a shorter Cut, and thence reach to the Heart more speedily.

LXIX. *To the* first Reason, *I answer, That the* Embryo *is not at that time nourished with the milky Juice, but with the remainder of the seminal Liquor, poured upon it by reason of its vicinity to it, entring the Pores, and soon after received into the Mouth:* And that the Navel-vein, being at length fastened to the uterine *Placenta*, can neither receive or attract any more milky Juice; So that an Agreement with it and the *Gastric Veins*, was ill contriv'd from hence. Moreover, supposing that any thing of the alimentary Juice were carried at that time to the Liver of the Birth through the Navel Vein; I say, it does not follow from thence, that the Chylus in Men born, passes also out of the Ventricle through the *Gastric Veins*, and out of the Intestins through the *Mesaraics*: That Comparison being altogether lame, seeing that several Parts are in such a manner serviceable to the Birth, which they cannot pretend to in Men born. Of which, all the Navel Vessels afford us an Example, the *Foramen Ovale* in the Heart; the Closure of the *Arteria Pulmonaris* with the *Aorta*, *&c.* besides that several Parts have no use as yet in the Birth, that come to be serviceable in Men born, as the Lungs, the Liver, the Spleen, the genital Parts, the Eyes, the Nose, the Ears. So that from the use of any Part in the Birth, there can be concluded no use of any Part in a Man born; as we cannot conclude any use of the *Gastric* and *Mesaraic* Veins from the use of the *Umbilical*.

LXX. *As to the second Reason, it seems to infer a very plausible Argument from sudden Refreshment, that follows after Eating and Drinking, which is thought to be occasioned from hence, because that the more subtil Part of the* Chyle, *passing by a shorter Cut from the Ventricle to the Spleen, gets far sooner to the Heart, and refreshes it, than if it were first to pass to the Intestins, thence thro' several milkie Vessels to the Vein called* Subclavia, *and so through the* Vena cava *to the Heart.* Nay, I have sometimes heard that for a farther Proof of this Assertion, that an Example was cited by *Regius* out of *Fernelius*, of a certain Female Patient, whose *Pylorus* or Orifice of the *Stomach* was wholly obstructed, yet did she eat every Day, tho' she threw what she eat up again, and in that manner liv'd a long time. Which could never have bin, says *Regius*, unless something of the *Chylus* had bin conveighed out of the Stomach through the *Gastric* Veins to the *Spleen*. 1. Because the *Chyle* enters no other but the milky Vessels. 2. Because there are no milky Vessels at all, that are carried to the Stomach, or from the Stomach (as *Deusingius* pretends to assert *Institut. Anat.* tho' I do not believe that ever any *Deusingian* will presume to make out) so that if the *Chyle* should pass from thence to the Spleen, it ought to be conveighed through the *Vas breve*, and other Blood-conveighing Veins; whereas they neither admit the *Chylus*, nor can receive it, for the Reasons brought concerning the *Mesa-*

raicks l. 7. c. 2. 3. Because the *Chyle* is not separated from the thicker Mass, nor enters the milky Vessels, unless Choler be first mixed with it, together with the pancreatic Juice, which doth separate and attenuate it by a peculiar Fermentation or Effervescency from the thicker matter that involves it; which Choler is poured forth into the Guts, and not into the Stomach, and if it should be carried to the Ventricle by Chance, that is, contrary to the usual Motion of Nature, and then Chylification is disturb'd. Now that the Chyle cannot be separated from the thicker Matter, or attenuated by Fermentation without the Intermixture of Choler, so that it may be able to enter the milky Vessels, is apparent in those People that are troubled with the yellow Jaundice; in whom, by reason that the Choler cannot flow into the *Duodenum*, by reason of some Obstruction of the *Cholodochus*, or any other Cause whatever, that Distemper happens, because the Choler being deny'd Passage into the *Duodenum*, the Patients cannot go so often to the Stool, and when they do, the Excrement is for the most part *Chylous* and white, collected together in the Guts, and cannot be fermented and distributed for want of Choler. * As to the suddain Refreshment after Meals, that comes not to pass by reason of any shorter Cut from the Stomach to the Spleen, and from thence through the Liver and *Vena Cava* to the Heart (which however is not a shorter way neither, than when it is carried from the Ventricle to the Intestines) but because the subtil Vapors of the Nourishment, penetrate through the Pores of the Ventricle to the Heart (For the whole Body, as *Hippocrates* testifies, is εὔροον, or full of Streams) and likewise all together gently tickle the Nerves of the *Sixth Pair*, common to the Heart and Ventricle; which is apparent from hence, because not only Nourishment, but all fragrant Smells, and cordial Epithemes or Applications, refresh those that are subject to swooning, and recover 'em out of their Fits; when as neither the Odors nor those things from whence the Odors exhale, reach either the Spleen or the Heart, but only the most subtil Vapors make their Passage through the Pores. And moreover 'tis wonderful to think how soon the thin Particles of the Nourishment, which require but little Digestion, pierce through the milky Vessels to the Vein *Subclavia*, and the Heart: I have given to Doggs, empty'd with long Fasting, liquid Nourishment of easy Digestion, and within three quarters of an Hour after having dissected 'em, I found in that short space of time a watery *Chyle*, very plentiful in all the lacteous or milky Vessels, carried from the Ventricle and the Intestines, tho' the Food seem'd to be all entire in the Stomach. The History cited out of *Fernelius* seems not to be very tightly quoted. For I do not remember that ever *Fernelius* wrote any thing of Obstruction of the *Pylore*. Indeed in his *L. 6. Patholog. c.* 1. he relates a Story of a Woman with Child, that had a hard swelling in her Stomach, so that no Nourishment could descend into her Stomach, but presently upon touching that Orifice they returned towards the Throat again, which Woman in two Months time, with all the Art and Endeavours that were used, could get nothing into her Stomach. But what is this Story to the Proof of the Opinion forementioned? He tells us the Nourishment could not descend into the Stomach, therefore no *Chyle* could there be made out of it; neither could the *Chyle* flow from the Stomach to the Spleen. The Story of *Philip Salmuth Cent.* 1. *Obs.* 20. might have bin cited and objected much more to the Purpose, of a certain Person who was troubl'd with continual Vomiting, and was forc'd to throw back all the Meat he swallowed, by reason the Passage was stopp'd by a Scirrhous or hard Swelling at the Mouth of the *Pylore*, as was found after he was dead. Another Story like this is recorded by *Benivenius observat.* 36. and another by *Riverius cent.* 1. *Obser.* 60. and another by *Schenkius exerc. l.* 1. *Sect.* 2. *c.* 33. not unlike the Story which *Jo. Vander Meer* related to me of an Accident seen as well by himself as by several of the Physicions in *Delph*, of a certain Woman that for half a Year lay very ill at *Delf*, and vomited up all the Meat she eat after some few Hours, the first well concocted, the next loathsome and smelling very badly: After which her Evacuations by Stool began to cease by degrees; so that for the first Week she did not go to Stool above twice or thrice, then once a week, and then hardly once in a Month, which brought her to nothing but Skin and Bone, till at length she dy'd: In whose Body, being opened, was found a *Pylore* all *Cartilaginous*, with an Orifice so small, that it would only give Passage to a little Needle. But seeing it appears by

* *How true this Passage is, I leave to those who have read what I have formerly writ in my* Synopsis Medicinæ *l.* 4. *c.* 8. *sect.* 10. § 14. *ad* 36. *but besides what we have there spoken we have had several Icterical Patients, in whom none of this has bin true, but their Stools have bin as numerous as before, and in some more numerous, and in most of them of as good a colour as formerly: Moreover, I have near a hundred times seen the Excrements Chylous, white, and sometimes like Clay, void of all manner of reddish or yellowish Colour, & yet the Person not only free from the yellow Jaundice, but also in good Health.* Salmon.

by these Histories, that the *Pylore* can never be suddenly nor long so streightned, but by degrees, so the passage of the *Chylus* is obstructed by degrees, from whence it comes to pass, that for want of sufficient Nourishment, the strength is wasted insensibly, and the Body emaciated by degrees: Seeing also that by their going to stool, tho' it were but very seldom, and for that the *Pylore* would admit the passage of a little Needle, that it would not admit a greater Body, it appear'd that the *Pylore* in those Persons was not totally obstructed, or if it were wholly clos'd up, yet that they did not live long by reason of that Obstruction, but dy'd in a short time, it cannot thence be prov'd that the *Chylus* passes from thence to the Spleen. For if this were true, the Patients strength would not have fail'd so soon through the Obstruction of the *Pylore*, nor have yielded so easie an Access to Death.

Whether the Chylus *enters the Gastric Veins.*

LXXI. Bernard Swalve *considering these Difficulties,* Lib. de Querel. & Approb. Ventric. p. 63, 64. *dares not assert that Refreshment is occasion'd by the* Chylus *coming a shorter way than through the Intestins, but writes that supposing a case of necessity, the little Orifices of the Gastric Veins in the Tunicles of the Ventricle gape a little, and that into them, it is not the* Chylus, *which is too thick, but a more Liquid Juice is speedily infus'd presently, to be intermix'd with the Blood flowing back to the Heart.* But according to this Assertion *Swalve* seems to offer a most cruel Violence to the *Gastric Veins*, and to force 'em to confirm his Speculation, as if by agreement he would, at his own pleasure shut 'em up, but upon this Condition, that they should not gape, but in a time of necessity, or being open, should not empty their Blood into the Cavity of the Ventricle (which otherwise might easily happen, and so occasion Vomiting of Blood,) and that they should not take the *Chylus* it self, but only sup up a Liquid Humour out of the Stomach, and so carry it in a hurry to the Heart.

The use of the Chylus. *A second Digression. Whether any parts are nourished by the* Chylus.

LXXII. *The use of the* Chylus *is to breed good Blood out of it: But whether any parts are nourished at the first hand by the* Chylus, *before it be chang'd into Blood, is a Controversie.* This *Galen* most plainly writes concerning the Ventricle, *l.* 3. *de Natural. Facult. c.* 6. in these words: *Moreover this is the end (that is of the Concoction of the Stomach) that so much as is apt and agreeing in Quality, should take some part to its self. And therefore that which is the best in the nourishment, that it draws to it self in the nature of a Vapour, and by degrees, stores up in its Tunicles, and fixes it to 'em. When it is fully satisfied, whatever of Nourishment remains, that it throws off as burdensome.* The same thing he also asserts, *c.* 12, 13. of the same Book. *Vallesius* confirms this Opinion of *Galen* by many Arguments, *Controvers. Med. & Philos. l.* 1. *c.* 14. *That the Ventricle is nourish'd by the* Chylus, *the shape of its Substance, and these Reasons over and above, teach us. If the Ventricle were not nourish'd by the* Chylus, *neither would it digest the Food. For why does it generate the* Chylus? *Is it not to send it to the Liver? Therefore 'tis the Care of the Ventricle to nourish the Liver*; and therefore it is not guided by Nature, but by Intellect. For those things that operate by Nature, are never concern'd with the care of other things. Moreover, either the Ventricle retains some part of the *Chylus*, and sends some part to the Liver, or it retains nothing at all of it. If it retain'd nothing, it would presently covet more, since only Nourishment seems to be that which can protect it from Hunger; and therefore the Blood alone is not proper to nourish the Members. *Endius Parisanus* is also of the same Opinion with *Galen*, *l.* 5. *Subtil. Exercit.* 3. *c.* 21. as likewise *Hen. Regius Medic. l.* 1. *c.* 4. neither do *Peramatus* and *Montaltus* differ from the rest. *Aristotle* contradicts *Galen*, who shews by many Reasons, *l.* 2. *de part. Animal. c.* 7. that the Blood is the last Aliment, and that all the Parts are immediately nourish'd by that, and not by the *Chylus*. *Plempius l.* 2. *Fund. Med. c.* 8. tho' he thinks that both Parts may be easily maintain'd by reason of the weakness of the Arguments; nevertheless he asserts with *Aristotle*, That the Ventricle, and all the Parts, are at first hand nourish'd with the Blood, and supports this Opinion by many Arguments. Of the same Opinion is *Bernard Swalve in querel. & Opprob. Ventric.* we are also enclin'd to approve the Opinion of *Aristotle*, *That the Blood is the last Nourishment.* But I would have this added, That the *Chylus* contributes a certain Irrigation necessary to moisten the Stomach and Milkie Vessels, without which they could not continue sound, tho' they may be nourished by the Blood. In the same manner, as many Herbs being ex-

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pos'd to the heat of the Sun, tho' they receive sufficient Nourishment from the Earth, yet languish and wither, unless they be often water'd; the moisture of the Water contributing new vigour to 'em; as loosning again the Particles too much dry'd and contracted by the heat of the Sun, and by that means giving a freer ingress to the Nourishment. In like manner the Tunicles of the Ventricle and Milkie Vessels, unless moysten'd by the *Chylus*, would grow too dry, and so the Pores of the Substance being contracted, would not so readily admit the nutritive Blood flowing into 'em, and for that reason would be much weakned, and at length quite fail in their Office. Which is the reason that by long fasting the *Milkie Vessels* are many times so dry'd up, that they can never be open'd again, which afterwards obstructing the Distribution of the *Chylus*, causes an *Atrophie* that consumes the Patient. But when there is a defect of that moisture in the Brain, then the troublesom contraction of its Tunicles causes Thirst, and the Vellication occasion'd by the fermentaceous Juice that sticks to 'em, begets Hunger, neither of which a *new Chylus* pacifies by its Nutrition, but the Humid Moistures swallow'd produce that effect, and the *Chylus* extracted out of those by their moist'ning, by which the contraction of the Tunicles is releas'd, and the Acrimony of the Juice yet twitches, is temper'd and mitigated. And that this is done only by Humectation, is manifest from hence; for that all moist'ning things, as Ale, Water, Ptisan, and the like, being plentifully drank, presently allay and abate the thirst and hunger for the time.

LXXIII. *But what shall we say of the Child in the Womb, which seems to be nourish'd by the Milkie Juice alone of the* Amnion *or Membrane that enfolds the Birth, at what time there is no Blood that flows as yet through the Navel Vessels?* To which I answer, That the Birth is nourish'd by the thicker Particles of the Seed remaining after the forming of the Body of the said Seed, first partly chang'd into Blood in the *Beating Bladder*, or *Bubble*; partly clos'd together by Proximity and some kind of Concoction: not that it is nourish'd by the *Chylus* or any Milkie Juice of the *Amnion Membrane:* but then the remaining Particles of the Seed being consum'd, then it is nourish'd by Blood made of the *Lacteous* Liquor of the *Amnium*. By which nevertheless it could not be nourish'd, were it destitute of that Moisture with which it is water'd by the *Lacteous* Liquor. See more of this *c.* 29. of this Book.

LXXIV. *If any one shall acknowledge, That the Stomach, which because it is manifestly furnish'd with several Veins and Arteries, is therefore nourish'd with Blood, but deny that the Milkie Vessels were to be nourish'd with it, when they receive into 'em no Blood conveighing Arteries.* I answer, That there are innumerable Parts in our Body, wherein the Arteries are not to be discern'd, tho' it be certain they enter into those Parts. And to which we can perceive no way through which the Blood should be conveigh'd; which Parts nevertheless are nourish'd by the Blood, and not by the *Chylus*. Of which sort are the *Corneous Tunicle*, the *Ureters*, the *Membrane* of the *Tympanum* or Drum of the Ear, sundry Ligaments and *Bones*, many *Gristles*, *&c.* In which number the *Milkie* and *Lymphatic* Vessels may be reckon'd. For tho' the Entrance of the Blood into 'em be not so perceptible, yet can it not be thence concluded, that the Blood does not find a way into those Vessels, when in many other Parts the Entrance of the Blood is not discernable, and yet their being nourish'd proves the Access and Entrance of the Blood.

CHAP. VIII.

Of the Guts.

I. *From the right Orifice of the Ventricle, call'd the* Pylore, *the Guts are continu'd; by the Greeks* ἔντερα ἀπὸ τοῦ ἔσω εἶναι, *because they are placed within the Body; and hence by the Latins call'd also* Interanea.

II. *They are Oblong Bodies, Membranous, Concave, Round, variously wreath'd about, reaching from the Ventricle to the* Podex, *serving to receive the* Chylus, *and to contain and make way for the Excrements.* I say for *receiving the Chyle, &c.* But it is a thing much controverted, whether they do not also contribute to the making the *Chyle*. For this seems to have been the Opinion of *Galen*, who *l.* 4. *de usu part.* has

The Guts.

Whether they do not contribute to the making the Chyle.

has these words; *The Guts, though they were not fram'd for the Concoction of the* Chylus, *but only to contain and distribute it, yet because Nature is sometimes slothful and idle, in its passage through the Guts, it comes to be perfectly elaborated.* *Aretæus* and *Aretius* follow the Opinion of *Galen*, and among the more modern Authors *Spigelius*; and the very Similitude of the Structure of the Ventricle, the Guts seem to make for him; as well in the Substance, Temper, Colour, and Contexture of the Tunicles. And *Plempius*, sway'd by these Authorities, *l. 2. Fund. Med. c.* 8. assumes the Affirmative; and affirms that the same Concoction which is perform'd in the Stomach, may be perform'd in the Guts (which *Regius* also inculcates) and hence concludes, the Clysters made of Liquid Nourishments, given at the Fundament, may nourish, in regard there is a thick *Chylus* concocted out of 'em in the Guts, and carry'd away through the *Milkie Vessels*, and so communicated to the whole Body. But we rather approve the Negative; for that seeing all manner of Crudity proceeds from a cold and moist Distemper of the Stomach, (as in a *Lientery*) the Meat is evacuated without any alteration, or without any manner of Concoction, which however, were there any chylifying virtue in the Guts running a long way through their crooked Windings and Meanders, would at least gain some kind of Alteration into a *Chylus*. Moreover, the Choler flows continually together with the Sweetbread Juice into the Guts, and in them indeed ferments the concocted Nourishment, but by the virtue of that peculiar Effervescency, and its Bitterness, it rather hinders than promotes chylific Concoction, as is apparent when it sticks in too great quantity to the Stomach. And then who can believe, that Clysters mixt with the Excrement in the thick Gut, can be chang'd into a *Chylus*, and consequently nourish the Body. The stinking Place, and the feculent Ordure therein intermix'd, plainly teach us, that there can be no alteration into *Chyle* made there. Perchance they may so far repair the strength of the Body, as some more subtil and benign Vapours may ascend through the Pores and Vessels to some superiour Bowels, and somewhat refresh 'em, in the same manner as the Odor of Wine, hot Bread, Honey, *Aqua vitæ*, and roast Meat, receiv'd thorough the Nostrils, refresh the fainting Spirits, tho' they be not turn'd into a *Chylus*.

III. *The length of the Guts exceeds or equals the length of the Person whose they are, six times more, or less, (others who also measure in the Stomach and Gullet, say seven times, or somewhat less.)* Hippocrates *stretches 'em out to twelve or thirteen Cubits.* Vesalius *to fourteen Italian Ells and a half. We commonly measure 'em at fourteen of our Dutch Ells, or very near.* Only in the Year 1668. in *November*, once at a Public Dissection we found the Guts of one Person to be sixteen Ells and a half; and hence, that they might lye in a little room, placed in the *Abdomen* with several windings and crooked Circumvolutions, and joyned to the *Mesentery*, by means of which they were ty'd to the Back, and sustain'd by the Cavities, the *Os Ilium*. *The length.*

IV. *There was a necessity for such a length and circumvolution, that the concocted Nourishment falling down from the Stomach, might stay the longer in the Guts, be more conveniently fermented by the mixture of the yellow Choler, and the Pancreatic Juice, and by that means the more subtil Parts of the* Chyle *being separated from the thicker Mass, might with more ease be thrust forward into the narrow Orifices of the Milkie Vessels, partly by the proper* Peristaltic *Motion of the Entrals, partly, and that chiefly, by the impulse of the Muscles of the* Abdomen, *mov'd by the force of Respiration:* And to that end, because the Separation ought to be made in the small Guts, Nature leads about, and forces the thinner Substances through several windings and turnings as through so many Stops and Remora's, whereas she carries the thicker Substances thorough a Circular and Oblique Passage only. Moreover, she has form'd certain little Folding-doors to open and shut, which hinder the over rapid course of those things that flow downward. For had the *Chylus* flow'd down through the short Guts, either before a due and convenient Fermentation, or could pass from 'em, whereby the Body had been deceiv'd of its due and convenient Nourishment, she had constrain'd Man to eat often for the support of himself, and to supply that defect by continual filling. Of this *Cabrolius* and *Riolanus* give us several Examples, that is to say of Men most voracious, in whom, after their *The reason of the length.*

their deceaſe, one Gut has been found, and that wonderfully ſhort, in the ſhape of a great Roman S. Add to this, that the Excrements had flow'd down much more ſpeedily, and had thereby expos'd Man to the more frequent duty of Evacuation.

Their Circumference V. *Their Circumference is round, to the end they may be more capacious, and for the more eaſie deſcent of thoſe things that paſs through 'em.*

Their Subſtance and Tunicles. VI. *Their Subſtance is Membranous, like the Stomach, having alſo a triple Tunicle.* The *Exterior* common, and overcaſt with Fat, ariſing from the Membranes of the *Meſentery*, ſpringing from the *Peritonæum*. The *Middlemoſt fleſhy*, interwoven with ſeveral thinner *Fibres*, eſpecially the tranſverſe and ſtreight Fibres. The *Innermoſt* nervous, which in the ſlender Guts is wrinkl'd, to ſtop the *Chylus*, and overſpread with a kind of fleſhy ſpongy Cruſt, but very thin, (which ſome call the *Periſtoma*, others the *Silken Covering*, others the *Woolly Moſs*) through which *Fallopius* believes the *Chylus* to be tranſmitted and ſtrain'd, as it were, through a Sponge; and to prevent the Injuries of the ſharp Humours, and for the better defence ſlippery, by reaſon of a ſlimy Clammineſs, generated out of the Excrements of the third Concoction; but in the thicker Guts dilated into little Cells. *Riolanus l. 2. Anthrop. c. 12.* writes; tho' without any ground, that the Carneous and Fleſhy Tunicle, which is the middlemoſt in the Stomach, is the innermoſt in the Guts, and that the innermoſt is thick, but however more nervous, and not much different from the inner Tunicle of the Ventricle.

Whether they have an attractive force. VII. *Now in regard the Guts are furniſh'd with Fibres of all ſorts; the Queſtion is, Whether they have an attractive Force, by which they may draw the* Chylus *out of the Ventricle.* Many maintain the Affirmative, induc'd thereto by the Authority of *Avicen*, and many other Arguments; but erroneouſly; ſeeing there is in 'em no ſuch attractive Force. In like manner there is alſo another Queſtion ſtarted concerning their Retentive Faculty. Both Queſtions are learnedly and at large diſcuſſed by *Andrew Laurence l. 6. Anat. c. 15. Quæſt.* 10, 11.

Nerves and Arteries. VIII. *They draw their Nerves from the ſixth Pair; their Arteries from the Meſenteric Branch, both upper and lower, and ſome from the Inteſtinal Branch of the Cœliac Artery.*

Veins. IX. *Innumerable Roots of ſmall Veins diſpers'd between their Tunicles, meeting together about the knitting of the* Meſentery, *form many Veins, from the Ingreſs of the* Meſentery, *which they aſcend together, call'd the* Meſaraics; *which at the upper part of the* Meſentery, *a little before its Ingreſs into the* Vena Porta, *cloſe together into two greater Branches, and ſo conſtitute the right and left* Meſaraic *Vein.*

The Milky Veſſels. X. *Into theſe Veſſels are ingrafted the* Meſenteric *Milkie Veſſels, gaping with their Orifices toward the inner Guts, and receiving the* Chyle *from 'em, and conveighing it to the* Grand *Receptacle of the* Chyle.

Temperament. XI. *The Temperament of the Guts is ſaid to be cold and dry; that is to ſay, ſpeaking comparatively, as they are leſs hot and dry than many other Parts.*

Their Uſe. XII. *The Uſe of the Guts appears by what has been ſaid already, not only to receive the Nouriſhment concocted in the Stomach, but alſo that a Separation may be made there in them, of what is uſeful, from what is unprofitable; and from them to ſend what is profitable into the Milkie Veſſels, and exonerate what is unprofitable at the Fundament.*

Their Motion. XIII. *Now the act of Propulſion and Expulſion, is perform'd by the Compreſſure of the Muſcles of the* Abdomen, *which is very much aſſiſted by the proper Motion of the ſmall Guts, proceeding from the Contraction of the Fibres, reſting in their proper Tunicles, which is very conſpicuous in living Cats and Coneys diſſected.* And it is moſt certain, that this Motion of the *Fibres* is perform'd by the *Oblique*, but chiefly by the *Tranſverſe Fibres*, and by them the Things contain'd are thruſt down from the upper Parts to the lower. Which Motion, if it happen to be irregular, which rarely happens, and that the *Fibres* by their Contraction move the things contain'd in the Guts, beginning from the lower Parts to the ſuperiour, then the Ordure carried up from the thick Inteſtines, aſcends into the Stomach,

mach, and is thence vomited out at the Mouth. Thus I remember I handled a young Lad that lay sick at *Nimmeghen*, who, besides many other nasty things, vomited up a Suppository that was given him at the Fundament. And here at *Utrecht*, in the Year 1658. in *April*, I had prescrib'd a Clyster to the most prudent and grave Consul *Wede*, who then lay very ill, which being injected at the Fundament, in a little time he vomited up again, from which extravagant Motion I concluded a Prognostic of Death, which ensued some few hours after.

An Observation. 1. 2.

The Division. XIV. *Tho' there be but one Gut from the* Pylore *to the Fundament, yet in regard of the thickness of the Substance, the Magnitude, Shape, and variety of Function, it is distinguish'd by Anatomists, into the thin or slender Guts, and into the thick.*

The thin Gut. XV. *The thin or small Gut, so call'd from the thinness of its Substance, possesses all the Navel-Region, and the* Hypogastrium. And this, according to the shape, situation, length, and plenty of Lacteous Vessels, is by the Ancients said to be threefold. The *Duodenum*, *Jejunum*, and *Ilium*.

The Duodenum. XVI. *The first is continuous to the* Pylore, *by* Galen *call'd* ἔκτυσις, *the springing, or proceedings forth: by the ancient Greeks, and* Hierophylus, δωδεκάδακτυλον, *and thence commonly by the Latins call'd* Duodenum, *from the measure of two Transverse Fingers; tho' most Modern Anatomists will hardly allow it the measure of four Fingers.* But if you reckon from the *Pylorus* to the Inflexion of the *Jejunum*, where it rises upward athwart, lying under the Sweetbread, then it will be found to be twelve Fingers in length.

The Substance. XVII. *This* Duodenum *contiguous to the* Pylore *upon the right side, nor wreath'd with Circumvolutions, tho' it be narrower than the rest of the Guts, yet is of a thicker Substance than all the rest of the small or thin Guts, and is bor'd thorough, about the breadth of four or five Fingers from the* Pylore (*but seldom about the middle of the* Jejunum, *though* Plempius *says he has seen it*) *in the wrinkle of its Flexure, where sticks out a little Teat, sometimes with one hole common to the* Cholidochus; *and that other found out by* Wirtzungius, *sometimes perforated with two several holes proper to both Chanels.* Which holes, if they be two, the one transmits into the *Ductum Cholidochum*, the other into the *Wirtzungian*. But if there be but one Chanel at the Ingress, (which is frequent in Men, very seldom in Dogs) then the Point thrust into that Gut toward the upper Parts, enters the *Ductus Biliarius*; if toward the lower Parts, it enters the *Ductus Pancreaticus*. *Vesslingius* reports, and daily Dissections teach us, that this Gut is found to be of an extraordinary laxity and largeness, and then seems to be joyn'd as a lesser Ventricle to the larger Ventricle. Which Laxity happens from the sharp fermentaceous and vitious Humours sliding into it; which occasions vehement fermentaceous Ebullitions, by which the Gut is not only very much distended, but often times fill'd with troublesome Rumblings, great Pains, sharp Prickings, and extraordinary Anguish which thence arise.

Situation. XVIII. *It begins, as has been said, from the* Pylore, *and by and by going down backwards under the Ventricle, it is reflex'd toward the right Kidney, and adhering to the broader end of the* Pancreas *or Sweetbread, is fasten'd to the Vertebers of the Loyns and the left Kidney by membranous Ligaments, and then extending it self downward to the beginning of its winding, ends under the* Colon.

The Jejunum. XIX. *The second is call'd by the Greeks* νῆστις, *by the Latins* Jejunum, *because it is found empty for the most part, as well for the great quantity of the Milkie Vessels that enter into it, as also because of the more speedy Ebullition of the* Chylus, *by reason of the Choler and Pancreatick Juice flowing at first hand through its proper Chanels, or its separation from the Dregs, and passage into the Milkie Vessels.*

Situation and bigness. XX. *It is in length about twelve or thirteen Palms, and about a Fingers breadth wrinkled with many windings; and seated under the* Pancreas, *near the Backbone, in the Region of the Navel, chiefly toward the left side, beginning from the first Circumvolution of the Intestines, and ending where it ceases to look black and bluish,*

and to be empty. *Theodore Kerckringius* *Observ.* 39. takes notice in this Gut of some little Valves or Folding-doors, as it were, for that they do not so shut up the Gut, as to fill up all its Cavity: But about the middle of its Cavity so shut it up, that being each of 'em broader at one end than another, they grow narrower by degrees, and then a little lower are received by another, which being broader in that part where the other is narrower, so frame and constitute the Gut, that those things which fall down from the upper Parts may slip down, but not be precipitated as it were at one fall. The same *Kerckringius* was the first also that discover'd and observ'd *Valves* or little Trap-doors like to these in the Colon Gut, which he has plainly shewn me in a thick and blown Gut, and then dry'd, which is the best way to discern 'em most perspicuously. And therefore he deservedly merits the Applause of this first Invention, seeing that never any Person before ever made mention of these *Folding Doors* or *Valves*, that I know of.

The Ilium *Gut.*

XXI. *The third proceeding from the forementioned, is call'd* Ilium, *by the Greeks* εἰλεὸν, *from its being twisted and twirl'd; and* Volvulus *by the Latins, by reason of its Circumvolution, and the multitude of its Twistings.*

Situation and bigness.

XXII. *This being seated under the Navel, next the Lateral Parts of the* Abdomen *and the Ribs, equals the breadth of a transverse Finger; and in length exceeding the other two Measures one or two and twenty Palms.*

XXIII. *The Original of it is where the Intestine begins to grow narrower, and being somewhat ruddy, ends at* Bauhinus's Valve, *where the Colon begins.*

The thick Guts.

XXIV. *That which follows is call'd* Intestinum Crassum, *the thick Gut, as being of a more fleshy and thick Substance; and that is also divided into three Parts, the* Blind, *the* Colon, *and* Intestinum Rectum, *or the Right Gut.*

The blind Gut.

XXV. *The first is that which the Greeks call* τυφλὸν, *the Latins* Cæcum, *so call'd from its obscure use; or else because it is not passible or penetrable at the other end; whence it is also call'd* μεσοκώλον, Mesocolon. And therefore it is a small Appendix, like a long Worm, sticking to the beginning of the *Colon*, in length about four Fingers transverse, having a small Cavity in People grown up altogether empty, but in the Birth full of Excrements. *Spigelius* has sometimes found a round Worm within it. In fourfooted Beasts it contains some Excrements for the most part.

Connexion.

XXVI. *It is not fasten'd to the* Mesentery, *but by the help of the* Peritonæum *is joyn'd to the Right Kidney.*

The Use.

XXVII. *The Use of this Gut was unknown till of late; tho' some there were that attributed to it this Use, others that, tho' all were but vain conjectures, with which they thought fitting rather to expose, than confess their own Ignorance.*

XXVIII. *The second of the thick Guts is called* Colon, as much as to say κοῖλον, or hollow, *as being the most hollow of all the Guts;* or as others will have it, from κωλύω to *hinder*, because the Excrements are Stops in its little Cells. This is larger and broader than the rest, as being eight or nine Palms in length.

Situation.

XXIX. *It begins about the* Os Ilium, *knitting it self to the next Kidney; hence it ascends upward, and then being turned toward the Liver, it proceeds athwart under the bottom of the Stomach, to which, by the help of the Caul, it is joyned, and on the left Hand is joyned to the Spleen and left Kidney with thin Membranes, and then winding about the left* Os Ilium, *weaves to the beginning of the* Intestinum Rectum.

It possesses the upper Part of the Belly. 1. To the end the Excrements that are gathered within it, may be rowl'd down by their Weight, and so the more easily exonerated. 2. To assist in some measure the Concoction of the Stomach by the heat of the Excrements; in regard the Chymists believe no Digestion to be so natural as that which is perfected by the heat of Dung. 3. Secondly, to prevent the middle Mesentery from being compressed by the weight of the Excrements: Which would very much straiten the *milkie* and *Lymphatic* Vessels, and *Mesaraic* Veins and Arteries.

XXX.

Its Ligament. XXX. *It has a proper Ligament, about the breadth of the middle Finger, according to its length extended at the upper Part from the* Cæcum *to the* Inteſtinum Rectum, *wherein the Row of little Cells is contain'd.*

Connexion. XXXI. *It is ty'd to the upper and lower Parts by the Aſſiſtance of the* Peritonæum. *Veſlingius* aſcribes to it two peculiar ſuſpenſorie Ligaments that never appear. But the Extremity of it, which below the left Kidney extends it ſelf to the beginning of the *Inteſtinum Rectum*, is ty'd to no part, but remains free from any manner of Band, and is overſpread with a good quantity of Fat.

Bauhinus's *Valves.* XXXII. *At the Ingreſs of the thin Gut, it has an orbicular* Valve, *or little* ſolding Door, *looking upwards, which prevents the Aſcenſion of the Excrements and Vapors, which from the firſt Finder, is now called* Bauhinus's *Valve*, tho' others rather aſcribe the firſt Diſcovery to *Varolius*, and *Salomon Albertus*: But *Riolanus* raiſes a bitter Conteſt concerning it.

XXXIII. *Anatomiſts do not agree in the Deſcription of this Valve.* 1. *Some ſay, that it is a Membrane ſticking to the Gut on one ſide, and drawing before it a Curtain.* 2. *Others ſay, it conſiſts of two Membranes oppoſite one to another, placed toward the inner Parts of the* Colon, *which cloſing together, ſhut up the thin Gut.* 3. *Others believe there is no true Valve in that place, but a fleſhy Circle, wrapt over the thin Gut, where it enters the thick one, and contracting it like the ſphincter Muſcle.* 4. *We our ſelves formerly, as has bin ſaid in the Preliminaries, could not think it to be any other than a looſe circular Membrane, or ſome little Lappet of the Ilium Gut, where it enters the* Colon: Which when any thing aſcends out of the *Ilium* into the *Colon*, gives way and opens: But when the quagmiry Excrements or Vapors deſcend from the *Colon* to the *Ilium*, falls and folds down, and ſo by obſtructing the way, hinders the paſſage towards the thin Guts; in the ſame manner as in the little long Gutters of Leather hanging out at the ſides of Ships, through which the Water that falls upon the Decks, readily flows out again. But tho' the Waves daſh upon thoſe Gutters, yet becauſe they do not mix with the Water, therefore the Water coming not into them, does not flow back. Now that we might be aſſur'd in this our laſt Opinion, I thought it convenient to fiſh out the Truth a little farther by ſome Experiment. And therefore having taken the *Colon* out of a Body, with a part of the *Ilium*, and ty'd it at both ends with a Pack-thread, and blew into it with a ſtrong Breath through a ſmall Pipe, and kept the Wind within with a ſmall Thread, and then dry'd the Gut, ſo diſtended, in the Air, till it became hard: And then we could clearly diſcern, not only thoſe half opening Valves of the *Colon* found out by *Kerckringius*, but we alſo obſerv'd the aforeſaid *Valve* of *Bauhinus*, to be a Membrane ſpread athwart over the Ingreſs of the thin Gut, and hanging ſomewhat over toward the inner Parts of the *Colon*, and bor'd through in the middle from one ſide to the other with a right or ſtraight Hole, as if ſlit with a Penknife. And ſo we obſerv'd alſo, that the Lips of both thoſe Openings cloſing, the Ingreſs of the *Ilium* into the *Colon* was ſo guarded by theſe *Valves* that nothing could fly back again. And by this View we found, that of the foreſaid four Opinions, the ſecond was the moſt probable, but that the firſt, third, and fourth, which was our own, was a Deviation from the Truth. Only that the third rightly and truly aſſerts, that there is a certain fleſhy Circle which laps the Ingreſs of the *Ilium* into the *Colon*.

The uſe. XXXIV. *In this* Colon, *the thicker ſort of Excrements are gathered together, and contain'd till the time of Exoneration, whereas it would be a great Shame and Trouble to have his Excrements continually dropping from him.* For which reaſon it is very large and capacious, and has little cloſing *Valves*, to ſtop and retard the Excrements. And by reaſon it encompaſſes almoſt the whole *Abdomen*, ſometimes aſcending, ſometimes deſcending, hence it happens that the Dregs and Excrements to be expell'd, paſs down more ſlowly, requiring two or three times of compreſſing it ſelf for their Expulſion.

The Inteſtinum Rectum. XXXV. *The third and laſt of the thick Guts, is the* Inteſtinum Rectum, *which deſcending in a ſtreight Line into the hollow of the Hips, ends*

in the Fundament. Call'd by the Greeks ἐνθυμένον, becauſe it runs on without any Excreſcencies or Windings; alſo ἄρχον, becauſe it is the Beginning; or ἄρχων, becauſe it conſtrains us as it were by a kind of Command, to quit our ſelves of the Burthen that oppreſſes us.

The Bigneſs. XXXVI. *It is far inferior to the* Colon *in Length and Breadth, as not being above one Palme and a half in Length, and about three Fingers broad; but in Thickneſs and Carnoſity exceeds all the Guts:* Being outwardly covered with fat Appurtenances.

Connexion. XXXVII. *It is ty'd to the* Os Sacrum, *and* Coccyx, *by means of the* Peritonæum, *and in Men is faſtned to the Root of the* Penis, *in Women to the Womb by a muſculous Subſtance, whence ſprings the great Conſent of theſe Parts.*

The Fundament. XXXVIII. *The End of it is the Fundament, called* Anus, *and* Podex, *which has three Muſcles: The Firſt, which is called* Sphincter, *and is faſten'd to the loweſt Parts of the* Os Sacrum, *embraces and purſes up the Fundament orbicularly, to keep in the Excrements. To this, there are ſome who add another, but of a thinner Subſtance for the ſame Uſe, inſeparably joyn'd to the former, and as it were riveted into the Skin, at the Extremity of the Fundament. But this the greateſt part of Anatomiſts confound with the firſt, and make but one of both. The other two are called* Levatores, *or* Fundament-Lifters, *which riſing from the Ligaments of the* Coxendix, *and* Os Sacrum, *deſcend diſtinct to the* Sphincter, *and intermix their Inſertions with it, to the end they may draw the Fundament back again, brought down by the Force of ſtraining, in Evacuation.* Tho' *Riolanus* derives their Original from the Bones themſelves, yet he divides 'em erroneouſly into four Muſcles, whereas ſuch a Diviſion cannot be made without Dilaceration, as *de Marchettis* well obſerves, *Anat. c.* 3. Theſe Muſcles being looſened by any Accident, cauſe a falling of the Fundament, or rather a ſinking down of the Gut.

Hæmorrhoid Veins. XXXIX. *Into the Fundament are ingrafted the Roots of the Hæmorrhoid Veins, which are two fold.* Of which, the Internal aſcending ſometimes to the Right, ſometimes to the Left *Meſenteric* Veins, and ſometimes to the *Splenic* Branch, empty their Blood into the *Vena Porta*; but the External enter into the *Hypogaſtric* Branch.

Arteries. XL. *Arteries accompany the Veins, proceeding partly from the lower* Meſenteric *Branch, and partly from the* Hypogaſtric *Arterie.*

Nerves. XLI. *To theſe, three or four little Veins joyn themſelves, deriv'd from the extream parts of the pith of the Back, which make this Gut very ſenſible, and infuſe Spirits into the Muſcles to enable their Contraction.*

CHAP. IX.

Of the Meſenterie.

I. THE *Meſenterie, or* μεσέντερον, *is ſo called from its Situation, as being placed in the middle of the Bowels.*

Situation and Uſe. II. *It is a membranous Part ſeated in the middle of the lower Belly; deſtin'd not only to bring the Veſſels ſafe to the Inteſtins, and carry 'em back again, but alſo to be a common Band of all the Guts themſelves,* leſt their manifeſt Windings and Turnings ſhould be confounded and intangl'd to the manifeſt hazard of Life and Health.

The Diviſion. III. *Which tho' it be but one, is divided by ſome into the* Meſaræum, *or* Meſenterie, *and the* Meſocolon, *while the thin Guts ſtick to the firſt, the thick Guts to the latter.*

Membranes. IV. *It conſiſts of a double ſtrong Membrane, continuous to the* Peritonæum, *and every where ſtuft with Fat.* Beſides which, *Wharton* writes *Adenograph. c.* 7. That he has found out and demonſtrated a Third Middlemoſt and proper to it, ſomewhat thinner than the former, and propping up the Veſſels and Kernels within it.

Bigneſs & Shape. V. *From the Center to the Circumference it is about the bigneſs of a Span. But the Shape of it is Circular,*

lar, whose Circumference is contracted into innumerable Folds, to streighten the length and widness of the Guts, and to contain their proper Situation and Order. In the Middle it is large, Oblong in the Sides, especially on the left Side, where it descends to the right Gut. But it is of an extraordinary thickness in fat People, the bulk of Fat being largely augmented: In others it is much more thin.

Its Rise. VI. *It rises about the uppermost and third Vertebra of the Loyns, to which it is ty'd with a very firm Connexion.* *Fallopius* believes it to derive its Original at the Nervous *Plexure*, or Knitting, from whence it takes its Beginning; of which more *c.* 18. *& l.* 3. *c.* 8.

Its Kernels. VII. *It has several very small and soft Glandules, inserted among the Membranes; and in the middle, one great one, all which it is most certain do manifestly conduce to the attenuation and greater Perfection of the* Chylus. And of these Glandules there is great Difference found in the number, not only in several sorts of Animals, but in many Individuals of the same *Species*: However this is observ'd in Man, where they are fewer in number, their bigness compensates that Defect. Now that they conduce to the Attenuation and perfecting the *Chylus* hence appears, for that innumerable milkie Vessels run through 'em (after what manner is to be seen *Cap.*11.) and pour the *Chylus* into 'em, to imbibe in it something of a slight subacid Quality, for its greater Perfection; which Vessels proceeding from 'em, meet together at length in the middlemost great Glandule, and thence in a direct and short Channel are carry'd to the Receptacle of the *Chylus*, into which they empty their milkie Juice. This Glandule *Fallopius* and *Asellus* erroneously call the *Pancreas* or *Sweetbread*, and many at this day, the *Pancreas Mesenterii*; but very far different from the real Pancreas seated under the Stomach.

The use of the Kernels. VIII. *This both Experience and our own Eyes do teach us. For if these Glandules come to be obstructed by any Accident, or that the Liquor bred in 'em (concerning which see something in the preceding Chapter, & l. 2. c. 2.) and which is to be of necessity, mix'd with the milkie Juice, has by any accident acquir'd an over acid Sharpness, then the milkie Juice within 'em becomes coagulated in the Form of a Cheese, and by reason of its abundant Overflowing swells very much:* By which means the Passage is obstructed to the *Chylus* that comes next, whence such People as are troubled with this Distemper (by reason of the Distribution of the *Chylus* is obstructed) are troubled with the Cœliac Flux, and grip'd with Pains in the Belly, and by reason of Passage deny'd to the Nourishment, labour under an *Atrophie*, and by degrees are wasted to death. Of which I have already given three Examples.

Observ. 1. IX. *The first was of a Scotch Souldier, who during his stay in* India, *and a long tedious Voyage upon his return, having fed upon unwholesom Dyet all the while, fell into a languishing Sickness, and labouring under a* Cœliac Flux *with Gripings of the Guts, tho' his Appetite was still indifferent good, was brought to our Hospital, where after he had lain three or four Months, and that all this had been try'd in vain to cure his* Cœliac Flux, *at length he dy'd as lean as a Rake.* The Body being opened, first there was to be seen an overgrowing Spleen hard and black; a Pancreas extreamly swell'd, hard and of an Ash Colour; we also found the innumerable Glandules in the *Mesenterie* (which in some Persons are hardly discernable) to be very tumid, and somewhat hard, insomuch that some were as big as a Bean, but most of 'em as big as a Filberd, and some few as big as a Nutmeg. But when they came to be dissected, there was nothing in 'em, but a certain white Cream coagulated into a milkie Substance.

Observ. 2. X. *The second Example was of a poor Girl of about eleven Years of Age, who dying of such a Flux of the Belly, accompanied with rumbling and Pain in the Belly, was reduced to nothing but Skin and Bone.* I open'd her Body in *November* 1656. at the request of her Parents, who believed her to have been bewitch'd and kill'd by diabolical Arts, and by the murmuring and hissing in her Guts, believ'd Snakes, Toads, and other Creatures to have bin bred in her Bowels. But when she came to be open'd, we found,

found, as in the former, innumerable Glandules of the *Meſenterie*, very tumid and ſomewhat hard, of which many were as big as a Filbert, and ſome ſomewhat bigger. Their outward Colour in ſome was white, in others ſpeckled like black and white Marble: But within ſide, as well in theſe as in all the reſt, was contained a very white milkie Juice, curdl'd into the form of a Cheeſe. The Spleen and *Pancreas* ſomewhat exceeded their due Proportion.

Obſerv. 3. XI. *The third Example was of a noble Daniſh Child, called* Nicholas Retz, *between ſeven and eight Years of Age, who having lain under a great* Atrophie *for ſeveral Months, accompanied with griping in the Guts, at length reduced to Skin and Bone, dy'd in* June 1662. Whereupon being deſired by his Friends and others, who had the Care of him, to examine the cauſe of the Child's Death for the Satisfaction of his Parents, I opened the Body in the Preſence of ſeveral Spectators; and there I ſhew'd the Liver, Spleen, Heart, Lungs, Kidneys, Ventricle, and Guts, all in good Order and well Condition: Only the *Pancreas* was ſomewhat ſwell'd and ill coloured: But in the *Meſenterie* appear'd the certain Cauſe of his Death: For that the innumerable *Glandules* of the *Meſenterie*, were ſwell'd to ſuch a wonderful degree, with an extraordinary hardneſs, ſome as big as a Filberd, others ſomewhat bigger, and many as big as a Bean: They were all of a white Colour, and contained in 'em a white Cream coagulated to the hardneſs of a dryer ſort of Cheeſe, which hindring the Paſſage of the ſucceding *Chylus*, was the cauſe of the *Atrophie*, and conſequently of the Death of the Child that enſu'd.

XII. *From whence it is ſufficiently apparent that the* Cœliac Flux, *and* Atrophie, *is occaſioned by the Obſtruction of thoſe* Glandules *or Kernels. Nor is that their Uſe, which Anatomiſts commonly aſcribe to 'em, that is to ſay to prop the Veins and Arteries carried through the* Meſenterie, *but in them, as in all Glandules, there is ſomething of a particular* fermentaceous Liquor *bred, to be mix'd with the milkie* Chylus; and for that Reaſon they become ſerviceable to the milkie Veſſels (not the *Sanguiferous*) and hence by reaſon of their Obſtruction, of ſomething elſe amiſs (ſuch as is occaſioned by a vitious Ferment mingled with the *Duodenum*) many times the Membranes of the *Meſenterium* are ſtuft with a world of ill Humors, the occaſion of languiſhing Fevers, and ſeveral obſtinate and diuturnal Diſtempers.

The Opinion of Riolanus.

XIII. Riolanus *has conceiv'd a ſtrange Opinion of theſe* Glandules, Anthropog c. 15. *while he aſſerts, that by reaſon of them, the Root and Foundation of all* Strumas *is in the* Meſenterie: *And that never any* Strumas *appeared without the Body, unleſs the* Meſenterie *were ſtrumous*; Which he ſays, was alſo the Opinion of *Guido* and *Julius Pollux*, with whom it ſeems he rather choſe to miſtake, than to underſtand by phyſical Practice and Philoſophy, that *Strumas* have no Affinity at all with the Glandules of the Meſentery, being only deſign'd for the farther Preparation of the *Chylus* alone. Neither can thoſe *Strumas* that break out on the outſide of the Body, pretend in any manner to any Cauſe or Original in the *Meſenterie*: Since daily Experience tells us, that moſt People who are troubled with *Struma's*, are ſound in all other Parts of their Bodys; nor do they complain of any Diſtemper in the lower part of the Belly, whereas the Diſeaſes of the *Meſenterie* are uſually very fatal to the Patient. And the very Cure it ſelf inſtructs us in the contrary, which is chiefly perform'd by Topics, that would never prevail, if the original Cauſe of the Diſtemper lay concealed in the *Meſenterie*. Laſtly in the Diſſections of Perſons troubled with *Strumas*, the ſame thing manifeſtly appears, who are for the moſt part ſeen to have a ſound *Meſenterie*.

Its Nerves.

XIV. *The* Meſenterie *derives its Nerves from the Plexure of the inner Nerves of the ſixth Pair; and the Nerves proceeding from the Marrow of the Loyns*; which cauſes it to be ſo ſenſible in its membranous Part, tho' it be more dull of Feeling in its Fat and glandulous Part, for which Reaſon *Apoſtemes* ly long conceal'd in it before they be diſcern'd as they ſhould be, either by the Patient or Phyſician.

Its Arteries.

XV. *Its Arteries proceed from the meſenteric Branch of the great Arterie, the Right and Left, or the Upper and Lower.*

Its Veins.

XVI. *It has ſeveral Veins running between its Membranes, call'd the* Meſaraic,

Meſaraic, *which riſing with very ſmall roots from the Tunicles of the Guts, and mutually opening one into another, as they frequently meet in the* Meſentery, *at length meet altogether in the two greater Branches, that is, the right and left Meſenteric continues to the* Vena Porta. Theſe infuſe the Blood, forc'd through the Arteries to the Meſentery and Guts, being the remainder of the Nouriſhment of theſe Parts, into the *Porta* Vein, thence to be conveigh'd to the Liver. Of the Uſe of the *Porta* and *Meſaraic* Veins, ſee more *l. 7. c. 2.*

Milkie Veſſels. XVII. *Beſides the Arteries and* Meſaraic *Veins, an innumerable Company of Milkie Veins, and many Lymphatic Veſſels run through it, of which we ſhall diſcourſe* c. 11. & 13.

CHAP. X.

Of the Pancreas *or* Sweetbread.

I. THE Pancreas *or Sweetbread ſo call'd in* Latin, *as being all Fleſh, is alſo call'd by another name* χαλίκρεας, *and by the* Latins Lactes, *from its inner white and milkie colour.*

The definition and ſituation. II. *It is a glandulous, looſe and ſhapeleſs Body, ſituated at the firſt* Vertebra's *of the* Loyns, *under the hinder part and bottom of the Stomach, cloath'd with a thin Membrane from the* Peritonæum, *and as it were hanging at it.*

Shape. III. *The ſhape of it is oblong and flat.*

Connexion. IV. *With its broader part adjoyning to the Confines of the* Liver, *it lyes under the Stomach near the firſt Verteber of the Loyns; and including the* Meatus Biliarius *and Trunk of the* Porta *is joyned to the* Duodenum: Hence it extends it ſelf toward the Spleen, and ſharpens by degrees, but is not faſten'd to it.

Its Subſtance. V. *The Subſtance of it is altogether glandulous, and conſiſts of many as it were little Knots or Knobs, cohering together by means of the* Vaſa Intercidentia, *or interpaſſing Veſſels, and many ſmall Fibres, and included in the common Membrane taken from the* Peritonæum. From whence it is that *Francis de le Boe Sylvius* deſcribes the Sweetbread to be a conglomerated Glandule; compos'd as it were of many ſmall Kernels gather'd in a cluſter together, and cloath'd with their own proper little Membrane. Theſe little Knobs make a ſhew of being hard, but taken together, ſeem to be very ſoft, by reaſon of their looſe Connexion.

Its Colour. VI. *The colour of it is pale, hardly ſhewing the leaſt tincture of any Blood; neither does it agree in colour with any of the fleſhy parts.* And hence proceeds the wonder, that by the ancient Anatomiſts it ſhould be call'd πάγκρεας, that is, *all fleſhy*; whereas it ſhould have been rather nam'd παγλαδιώδης, or *all kernelly.*

Its bigneſs. VII. *The bigneſs is not the ſame in all Perſons; for ſometimes you ſhall find it to equal the length of ſix, ſeven, or more croſs Fingers, ſeldom ſo ſhort as three or four.* Its greateſt breadth is generally two Fingers and a half; its thickneſs the breadth of one Finger.

Its weight. VIII. *The weight of it is various, according to the weight and difference of the Body.* Wharton *has obſerv'd it in Men of full-grown Age to weigh four or five Ounces for the moſt part. Regner de Graef* has obſerv'd it in Horſes to weigh eleven Ounces. In ſickly People it exceeds the uſual bigneſs, and is often full of Corruption (of which *Riolanus, Hildan, R. de Graef, Horſtius, Tulpius, Blaſius*, and others, give us ſeveral Examples,) and ſometimes alſo little Stones breed within it, as were found to the number of ſeven or eight, at *Paris*, in the Body of a certain deceas'd Nobleman, by the Report of *R. de Graef, lib. de Succ. Pancreat.* who alſo adds in the ſame place another Example out of *Sennertus*, of a *Pancreas* harden'd to a Griſtly Subſtance.

Its Nerves. IX. *It is furniſh'd with ſmall Nerves from the ſixth Pair, more eſpecially from the upper Plexure of the* Abdomen.

Arteries. X. *It receives its Arteries from the left Branch of the* Cœliac *Artery, leaning toward the Back; and ſometimes from the Splenic Artery.*

Veins. XI. *It ſends forth its Veins to the Splenic Branch near the* Porta: *Furthermore, it tranſmits a Trunk of the Vein,*

Vein, which in some measure it embraces.

Lymphatic Vessels.

XII. *It is also stor'd with many Lymphatic Vessels: In the middle part of it, according to its length, a peculiar Chanel extends it self, indifferently capacious, and consisting of a thin and strong Membrane, call'd from the first Discoverer* Ductus Wirtzungianus.

XIII. *This one Chanel runs through the middle of the Bowels, and receives an innumerable Company of little and small Vessels, open into it from all parts of the Bowels. Among which there is one somewhat bigger than the rest, which it admits in its lower part, not far from its Ingress into the Intestin.* Sometimes there are two Chanels to be found, but not equal in their length, of which the one keeps its wonted Station; the other remains a little lower; but both are joyned together for the most part, and make one Orifice: Sometimes also the other enters the *Ductus Cholidochus* near the *Duodenum*, while t'other perforates the Intestine a little below. *Frederic Ruisch, Observat. Anat.* 12. writes, That he has often observ'd two *Pancreatic* Chanels in Human Carkases, of which neither had any Communication with the *Ductus Cholidochus*: also that he rarely found this Chanel single in Dogs. For that in reference to this Chanel the Sport of Nature is various, even in the same Creatures sometimes, but more especially according to the diversity of Animals. For that some have one, which is most frequent in Men: Others two, others three, which being often joyn'd together, before their Exit out of the *Pancreas*, sometimes enter the Intestine separately. In some, they are inserted into the *Ductus Biliarius*; in others, partly into the Intestine, in some few, they are inserted into the Stomach; which happens most frequently in some sort of Fish.

XIV. *The Chanel call'd the* Wirtzungian, *tho' it be easily discover'd in Men, yet is not so soon found out in Dogs; because their* Pancreas *is not contracted, as in Men; but thin and extended in length; and sometimes as it were divided into certain Parts.* But if the Instrument be thrust into its Orifice, where it opens into the *Duodenum*, the Chanel is presently to be found.

The Exit of the Chanel.

XV. *The Orifice of the said Chanel discharges it self into the* Duodenum, *having an opening sufficiently large, sometimes the breadth of four, sometimes five or six Fingers from the* Pylorus, *in a remarkable wrinkle of the Flexure of the* Duodenum, (where there is a very small extuberancy, denoting its *Exit*) next to the going forth of the *Biliary* Pore in Men, in Dogs about two Fingers breadth below the *Exit* of the *Meatus Biliarius*, and not unfrequently opening into the very *Biliary* Chanel it self, (as is familiarly observ'd in Sheep) and some affirm that there is a *Valve* belonging to it, looking outward, and obstructing the Ingress of any thing out of the Intestine into the Chanel. But because the Chanel from part of the Intestine easily admits the Instrument, and for that this *Valve* did never manifestly appear to us, we are apt to believe, that an Oblique Insertion into the Intestine is sufficient to exclude the Humours, as shall be said concerning the *Ductus Biliarius*, *c.* 15. In another part being extended toward the Spleen; it grows slenderer and slenderer, till it quite vanishes, before it reach the extream Part of the *Pancreas*, so that it never touches the Spleen, nor enters it, which is that which some have endeavour'd to perswade us.

How *Nicolas Steno* found this *Chanel* call'd *Wirtzungian* in Birds, he most elegantly describes *Lib. de Musc. & Glandul.* in these words:

XVI. *There is*, saith he, *an Observation made upon Birds, that is of very great use for the Explanation of the* Wirtzungian Duct. *For in several sorts of Birds, I have seen a double Pancreatic Chanel, meeting also with a double* Ductus Biliarius (*of which the one comes from the Vessel of the Gall, where it does not lye upon the Liver, the other from the Liver it self*) *the Insertion of which four Vessels varies three manner of ways. For either they all meet together in one Mouth, or every Pancreatic Chanel, with its Bilary, enters into a common Mouth, so that the Intestine is only pervious at two holes; or else every Chanel having its own particular Chanel, is the occasion that there are four ways into the Intestines. Lately I saw the* Hepatic Ductus *in a Turky-Hen, where it went forth out of the Liver,*

Liver single, but then being divided in its progress, it ran to the Intestine with two little Chanels, so that the Intestine by that means receiv'd the Choler out of three little Vessels.

XVII. *Into this* Wirtzungian Duct, *out of all those little Knots, of which the* Pancreas *consists in Men, certain little Branches like small Rivulets run abroad, and pour out the Pancreatic Humour, prepar'd and concocted in the little Knots of the said* Pancreas, *to be thence carried to the* Duodenum. But in that Chanel there is never any *Pancreatic Juice* to be found, because it flows with a steep Current into the *Duodenum*, and never stays in the Chanel: In like manner as the Urine flowing from the Reins through the Ureters, by reason of its rapid Passage, is never to be found in them.

Whether the Chanel be an Artery.

XVIII. *I admire at* Lindanus Med. Physiol. c. 16. Art. 16. vers. 244. *where he asserts this Chanel to be an Artery; but that it is uncertain from whence it springs, whether from the* Aorta, *or the* Cœliac, *before its Splenetic Emission.* Assuredly it has no similitude with the Artery, neither in Substance nor in Use, neither is it any where continuous with the Arteries: neither does it beat, or contain any Blood as the Arteries, but without any Blood carries in it a certain peculiar Liquor; neither does it discharge it self into the Veins, as the Arteries do, but into the Cavity of the Intestine. Neither is it true which *Lindanus* adds, that is to say, That from this Chanel (which he calls an Artery) several little forked Branches are extended into that Bowel, whereas indeed several little forked Branches run out from the little Knobs of the Bowel into the Chanel, as has been said. Therefore less erroneous were they, who affirmed this Chanel to be a Vein, as resembling a Vein in the Structure and Species of its Substance, whereas indeed it is no Vein, nor carries any Blood, but is another sort of Membranous Vessel, appointed for the Conveyance of a peculiar Humour.

The Office of the Sweetbread

XIX. *As to the Office of this Bowel (and I hope no Body will be offended, that by virtue of a peculiar Philosophical Licence, we call this noble Glandulous Body a Bowel) there have arisen sharp Contests;* while some affirm'd that it did only support the Divisions and Separations of the Vessels, and lay under the Stomach like a Pillow; others asserted that it fed upon the cruder Portion of the Blood; others that it assisted the Heart in Sanguification; others that it drew Melancholy from the Spleen, or furnish'd the Stomach with fermentaceous Juice, or supply'd the place of the distemper'd Spleen. Others that it receiv'd the *Chylus*, and concocted it to a greater perfection, and separated the Choleric Excrement from it. All which Opinions, when I found 'em to be meerly Conjectural, and altogether uncertain, nor supported by any solid Reasons or Experience, I thought fit to be a little more diligent than ordinary in the Examination of this almost neglected part of Anatomy: and at length, after many Experiments (of which some succeeded ill, some well; for that besides the *Pancreatic Juice*, there flow'd for the most part great store of Choler by the *Ductus Cholidochus* into the *Duodenum*, ty'd both above and below, and then slit long-ways; which Choler spoil'd both the Colour and Taste of the Pancreatic Juice) I found by the Dissections, as well of Living as of newly strangled Creatures, a certain Sublimpid and Salivatick, or Spittly sort of Liquor flow from the *Ductus Pancreaticus*, somewhat sowre, and slightly Acid (tho' *Needham*, contrary to all Experience, denies its Acidity.) And sometimes, having something of Saltness mix'd with it (and the same in mangy Dogs I have observ'd to stink, and to be of a very ill taste) I say I observ'd this clear and salivous or spittly sort of Liquor to flow from the *Ductus Pancreaticus* into the *Duodenum*, and that sometimes to a very considerable quantity; but never any of the *Vasa Chylifera* extended to this Bowel, nor ever was any *Chyle* found in it.

A Digression.

XX. *Whence I judg'd, that tho' several Anatomists have describ'd several* Vasa Chylifera *running out of this Bowel, and caus'd 'em to be delineated in their Tables; nay tho'* Schenckius *himself deriv'd the* Vasa Chylifera *from hence, and were distributed from hence toward the* Mesentery, *tho'* Vesslingius *and* Baccius *affirm that the* Chylus *flow'd out of it being wounded, and tho'* Dominicus de Marchettis *fancy'd that he had observ'd several Chanels running out toward the Liver, and distributed from it to the Guts, yet that all they*

The use of the Sweetbread Juice.

were deceiv'd by some preconceiv'd Opinion; and that neither the Vasa Chylifera *do run out of it, neither is the* Chylus *emptied forth into it, but that there is in it a peculiar Humour concocted in it, bred out of the serous and saltish part of the Arterious Blood which is carried into it, mixt with some Animal Spirits brought and conveigh'd through the small and scarce discernable Nerves. Which Humour flowing into the* Duodenum, *and being there mixt with the Choler flowing also thither, and the Nourishment digested in the Stomach, and falling down through the* Pylore *into the Stomach, raises a peculiar Effervescency in those Aliments, by virtue whereof the profitable Chylous Particles are separated from the Excrementitious, attenuated, and made more fit for Liquation and Distribution.* And this Operation is apparent from the Diversity of the Substance of the Aliments concocted in the Stomach, and still contain'd there, from the Substance of those which are already fall'n down into the Guts. For those are more viscous and thicker, and retain the Colours of the various sorts of Food; These more fluid, less slimy, and more white. Which aptness for Liquation is prepar'd, to the end that by the *Peristaltic* Motion of the Intestines the *Chylous* Particles may be forc'd through their innermost mucous Tunicle into the Milkie Vessels, while the rest that are more thick fall down by degrees into the thick Guts, there to be kept till the time of Evacuation. Now this Effervescency is occasion'd by the Volatil Salt of the Choler, and the sulphurous Oyl meeting with the Acidness of the Pancreatic *Juice*, as in Chymistry we find in like manner the same Effervescencies occasion'd by the meeting together of the like Mixtures.

XXI. *These things being more seriously consider'd, I was confirm'd in my self, that the* Pancreas *or Sweetbread is no such useless Bowel, as it is by many describ'd to be; nor that the Juice which is prepar'd within it is so small, that it can scarcely be discern'd, nor that it is unprofitable or excrementitious, as many have hitherto thought; but that it is a Juice of which there is a moderate Quantity, and by reason of its specific subacid Quality very necessary to raise a new Effervescency in the Guts, together with the Choler that is mixed with it, of the Nourishment concocted and fall'n already down from the Stomach, and by that means a separation of the profitable from the unprofitable Particles, and that therefore a sound Constitution of Health depends in good part upon a sound* Pancreas *or Sweetbread, and that through the unsoundness of the Sweet-bread many Diseases proceed, hitherto ascrib'd to Distempers of the Spleen, Liver, Mesentery, and other parts.* And it may be easily observ'd, that upon its Juice being out of order, that is either too plentiful or too sharp (especially if there be too copious a mixture of sharp Choler) there is occasion'd an Effervescency too violent and disorderly in the Guts, which is the cause of sowre Vomits, Belchings, Wind, distension of the Bowels, Diarrhea's, Dysenteries, Colick Passions, and several other Diseases; tho' it is as certain, that most of these Diseases may proceed from a vitiousness in the Choler only.

XXII. *On the other side, if the Sweetbread Juice be two scanty, too mild and insipid, it causes but a weak Effervescency, Obstructions, Atrophie, and extraordinary binding of the Body. Or being too Salt and Acid, and rising toward the Stomach, it occasions Canine Hunger, Reaching, sowre Belches,* &c. *but falling down into the Guts, extraordinary Gripings, Corrodings, Loosness,* &c. *Ascending toward the Head, together with the Blood, Epileptic Convulsions, and as it were Hysteric Passions, and Melancholy Ravings.* Therefore *Highmore* out of *Aubertus*, relates, That in a noble Woman, long troubled with an *Epilepsie*, and as it were an *Hysteric Passion*, and at length dying of those Distempers, there was nothing found defective but her *Sweetbread.*

XXIII. *Ascending toward the Stomach or the Heart, it causes Palpitations of the Heart, Swooning Fits, together with an inequality and weakness of the Pulses,* &c. Thus *Highmore* relates from the same *Aubertus*, That a Merchant of *Leyden* could not sleep, or if he did, he swooned away, and at length went away in one of those Fits;

Fits; in whose Carkass, all other parts being safe, only the Sweetbread was found putrified with an *Apostheme*. And thus according as this Juice is variously affected, it occasions various Distempers, as are to be seen in those that are troubled with Hypochondriacal Diseases, of which a great part are to be attributed to the bad disposition of this Juice. Which Impurities it contracts; partly through ill Dyet, as salt Meats, smoak'd Meats, Sowre, Acid Food, and such like; or through the bad Concoctions of the other Bowels, especially of the Spleen: For that from these Causes, by reason of the vitious Ferment of the Blood, many Particles of the Blood in the Heart being render'd less spiritous, and somewhat acid and salt, and remaining prone to Coagulation, and so being carried through this Bowel to the Arteries, cannot be sufficiently concocted therein, nor chang'd into a Ferment convenient and proper for the concocted Aliments already slid down to the Guts.

XXIV. *Two years after I had made these Examinations, and committed 'em to writing, there was brought me a Disputation of the* Learned Regner de Graef, *once my Scholar, held in the Academy of* Leyden, *under the Presidentship of the famous Professor* Fr. de le Boe Sylvius, *concerning the* Pancreas *or Sweetbread, and its Juice, which confirm'd me much more in my Opinion.* For at length, among many other Experiments, after several Endeavours and Inventions to little or no purpose, he found out an ingenious way, whereby this Juice might be gathered together in a living Dog; which he afterwards very liberally shewed to Us, and several other Spectators, in the Month of *March*, 1665. He took a fasting Dog, and having ty'd his Mouth that he should not bite, and opened his *Aspera Arteria* with a *Pen-knife*, that he might breath through that hole, presently he ript open his *Abdomen*, and then binds the Gut, as well under the *Pylore*, as under the *Egress* of the *Pancreatic Ductus*, and then dissects and opens it between those two Ligatures in the External Part, which is free from the *Mesentery*; and with a Sponge wipes away the Choler, Flegm, and other Stuff which he found there. Then taking a small Quill of a wild Duck, at the one end of which he had fitted a small Glass Bottle close stop'd round about, he thrust the other end into the *Ductus Pancreaticus*, which in Dogs is two Inches broad below the Egress of the *Ductus Biliarius*; and then with a needle and a double Thred, sew'd the Gut and the *Ductus* to the Quill and the Bottle, so that the Quill with the Glass Bottle, hanging without the *Abdomen*, should not stir either from the Gut or the *Ductus*. This done, he put back the Guts that hung out before into the inner Parts, and sews up the slit of the *Abdomen* with a strong Thread, and so keeps the Dog alive as long as he could, that is, for eight or ten Hours. In this manner, within the space of seven or eight hours, he received into his Bottle an indifferent quantity of this Limpid Juice that distill'd into the Bottle thorough the Quill, sometimes half an Ounce, sometimes six Drams, sometimes a whole Ounce; of which we tasted, and found the taste to be the same as I had tasted in several of my Experiments before mentioned, that is, a little sowre, somewhat saltish, and somewhat Subacid. The whole Operation *De Graef* relates more at large in his Disputation, and describes in his Tables annexed; and farther testifies, That in some Dogs, that perhaps were not so sound, he has observ'd that Juice to be very impure, that it yielded sometimes a stinking, sometimes a nauseous, sometimes a very austere and astringent taste; in so much that they who tasted it were all that day troubled with an uneasie Suffocation, sometimes with stinking Belches, and Reaching of the Stomach. The same *De Graef*, in a little French Book which he published in the Year 1666. upon the same Subject, writes, That at *Anjou*, in a Man that dy'd suddenly, and was dissected before he was cold, he collected together the Pancreatic Juice, and found the Acidity of it to be so very pleasant to the taste, that he never tasted the like in Dogs. And in the same Book, and more at large in *Lib. de Suc. Pancreat. Edit. An.* 1671. *c.* 7, 8, 9, 11. he discourses of the Qualities of this Juice, how being mixed with the Choler, it promotes Effervescency; and causes the *Chyle* to be white; and what Distempers it causes, if vitious; all which would be too long here to repeat. Most certainly a most ingenious Invention, and for which the Industrious and Learned Discoverer deserves a high Applause, who by this Industry of his has lighted us a Candle to the better and clearer knowledge of most Diseases.

XXV. *But by the way we are to observe, That as the first Discoverers of new Inventions are generally giv'n to err in this, that they have such a tender affection for their new-born Embryo's, tho' yet but weak and imperfect, that they will observe no Deficiency or Error in 'em, but with an extraordinary Pride, loathsome to all Company, endeavour to extoll 'em above others, more mature and perfected by Age and Experience; So does* Regner de Graef *in this part shew himself a little faulty, while he following the most famous* Francis de le Boe Sylvius, *from this one discovered Cause of many Diseases, endeavours to deduce the Causes and Originals of all Distempers; believing that* Diarrheas, Dysenteries, Colic, Epilepsies, Syncopes, Hysterical Suffocations, Fluxes of the Terms, Agues, *and I know not how many other Diseases, proceed from this one Cause; as if no other vitious Humours, bred by the ill Habits of the other Parts, could ever occasion such Diseases.* Whereas a thousand Dissections of Bodies, that have dy'd of those Diseases, plainly demonstrated that those Diseases were occasion'd by the vitious habit of the other Parts, in regard the *Pancreas* in them was absolutely sound.

XXVI. *We have also in the sight of many Spectators demonstrated, that when the Sweetbread has been safe and untouch'd,* Diarrheas, Dysenteries *and* Colicks *have proceeded from some Corruption of the* Liver *and Choler;* Epilepsies *from the depravation of the Brain and* Meninx's, *or by some stinking Ulcer in the Ear: also that several* Fevers *are occasion'd by vitious Humours bred in the Body through the bad Temper, ill Concoction, Corruption, Ulceration or Inflammation of the other Bowels and Parts, as in* Pleurisies, Inflammations of the Lungs, Squinancies, Phrensies, &c. *Also that many times deadly Symptomes and most terrible* Hysteric Passions *and Fits are occasion'd only by the Distemper of the Testicles preternaturally swell'd, and containing a virulent, yellow, livid Juice, sending up virulent Exhalations to the upper Parts.* Which Diseases have been many times cur'd by the Evacuation of that vitious Matter, without applying any Medicins to the *Pancreas* or Sweetbread, that was altogether Innocent of the Distemper.

XXVII. *In the Year* 1667. Novemb. 16. *I dissected in our Hospital a Carkass of a young Maid of four and twenty years of Age, which had lain sick for three years together, sometimes troubled with immoderate defluxions of her Courses, sometimes with Gripes of the Colick, sometimes with Diarrhea's, and want of Appetite; lastly an Anasacra or Hydropsical swelling of the whole Body; and toward her latter end oppress'd with a tedious Cough, accompanied with filthy Spittle; in which Body we found the Sweetbread almost entire, and without any Dammage; but the Liver was in a very bad Condition, not dy'd with a red, but with a black and bluish Colour, and the Lungs full of many little Ulcers.* Which being seen, many Persons, as well Physicians as Students in Physic, renounc'd the Opinion of *Sylvius*, and *Regner de Graef.*

Whartons *Opinion.*

XXVIII. *On the other side* Wharton *has started a new Opinion concerning the Use of the Sweetbread, believing the Excrementitious Juices of the Nerves to be purified therein, and chiefly of that Complication which lies under the Nerves. Which from the sweet Taste of the Substance of the Sweetbread, he judges not to be bitter or sharp, but sweet and insipid.* But in many other Places of his *Adenography*, he discourses after another manner of the other Glandules; and affirms 'em to prepare the Alimentary Juice for the nourishment of the Nerves. But who can believe that there should be a redundancy of Excrements in the most pure Animal Spirits, and that they should flow from all parts of the Body through invisible Pores to the *Pancreas* only, there to be separated from the Animal Spirits? Or who is not able to see that the thicker Juices prepared in the Glandules, can never pass thorough the thick Substance of the Nerves, but they must occasion Obstructions and Palsies. But more of these things *l.* 8. *c.* 1.

XXIX. *By what has been said, it is apparent how far the Ancients, and many*

many of the Moderns were mistaken in their Opinions concerning the Use of the Sweet-bread; and among the rest Fernelius, *who asserts that most of the superfluous and unprofitable Moistures are heaped up together in the Sweet-bread as in a Sink, and thence flow into the Guts.* But in regard this Bowel it self is covered with a thicker Membrane, and all the particular Glandules are covered by themselves with a thin little Membrane, nor has it any other Vessels that enter into it, unless some very small Arteries and Veins, and very slender Nerves, there does not appear any way for the superfluous and excrementitious Moistures of other Parts to enter the Sweet-bread: Besides that there is no Reason why they should be forced more to this Part than to the Kidneys, Guts, or other evacuating Parts.

XXX. *Seeing then it is apparent by what has bin said, what the Constitution and Use of the Sweet-bread, and Sweet-bread Juice is. We will only add two Things by way of Corollary.* 1. How that particular Juice is generated in the Sweet-bread? 2. How Great, and what sort of Effervescency it raises in the Guts.

The Generation of the pancreatic Juice.

XXXI *As to the First, our modern Philosophers teach us, that the Blood contains in it all manner of Humors, Acid, Bitter, Salt, Sweet, Insipid, Thick, Thin,* &c. *And that, of these, certain particular Parts of the Body admit of such and such particularly, which by reason of certain Disposition of Magnitude and Figure, have an extraordinary Analogy with their little Pores; but exclude others by reason of their Disproportion: And so by reason of that specific Constitution of the Pores, the cholerick Humors are most properly separated in the Liver; the Serous in the Reins, and the pancreatic Juice in the Sweet-bread.* But tho' it must be granted, that in the Nourishment of the singular Parts by reason of the certain and peculiar Disposition of the Pores in each, some Particles of the Blood stick to these, others better and more closely to those, till they are changed into their Substance: Yet this is not to be granted in the Generation of Humors, from whence at length, that general Nourishment, *the Blood*, proceeds. For in the Blood is contained a Matter, out of which Humors of all sorts may be form'd, as it is fermented, mingl'd, and reconcocted in these or those various Bowels, and several Parts, yet is there not in the Blood any Pancreatic, Splenetic, Choleric Juice, *&c.* (as in *Wheat* and *Bread* there is not really any *Chylus*, *Choler*, or *Blood*) but it is a *Heterogeneous Matter* containing such and such different Particles, which being after a peculiar manner mingled and concocted in the proper Vessels, become Humors Sweet, Bitter, Acid, *&c.* Not by reason of any Analogy with the Pores, but because of the specific Nature, Temper, and Structure of the specific Parts. And thus the matter is contained in the Earth, out of which, according to the Variety of Mixture and Concoction, a thousand sorts of Herbs, Trees, Flowers, Shrubs, and other things are generated: And thus in like manner several Forms of things are shap'd by the Hands of the Artificer: While one makes Statues, another Bricks, another earthen Vessels of all sorts, tho' such things were never in the Earth before, nor could be said to have bin. The Blood therefore, which is sweet, flowing through the splenic Arterie into the Spleen, is there depriv'd of the greatest part of its Sweetness, and gains a subacid Quality somewhat saltish; not by reason of the Pores of the Spleen, but by reason of the natural subacid Quality of the Spleen, which it infuses in the Blood and certain other Humors that accompany it. Sweet Wine thus grows sowre, being pouted into a Vinegar-Vessel; not by reason of the Pores of the Vessel, having some kind of Analogie either between the Wine it self and the Particles of the Vinegar, or else because there was an Acidity in the Wine before, and its acid Particles were only mix'd with the Vinegar, and the sweet not mixed; but because the sowre Acidity of the Vinegar, contained in the Vessel, might there fix the sweet sulphury Spirits of the Wine, and exalting the Salt and Acid above 'em, altogether deprive it of its Sweetness. For in that manner is Choler bred in the Liver: not that it was really præexistent in the Blood, or for that the Pores of the Liver have any *Analogie*, with the choleric Particles of the Blood, were the occasion of its being separated from it; but because the sweet Blood, flowing in great Quantity through the splenic Branch

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to the *Porta* out of the *meſaraic* Veins, with a mixture of the ſplenetic Juice, becomes ſo altered, that it is fermented and concocted after a new Manner in the Liver (which proceeds from the peculiar Temper, Structure, and Ferment prepared in it) by which means many Particles of it are made Choler, which were not ſo before that new Mixture and Concoction: Concerning which ſee the following 15*th. Chap. de Generatione Bilis.* And thus it is in the *Pancreas*, wherein ſome part of the Blood flowing into it through the ſmall Arteries, is changed into Sweet-bread Juice (the reſt proceeding forward to its Fountain the Heart) not by reaſon of the Analogy of the Pores of the Sweet-bread with that Juice; but by reaſon of the new Alteration which the Blood undergoes in it, occaſioned by the particular Property or Nature of the Part, together with the new Mixture and Concoction.

The Efferveſcency of the Choler, with the pancreatic Juice.] XXXII. *As to the ſecond we have affirm'd, that the pancreatic Juice being mix'd with the Choler that flows to it, cauſes a new Efferveſcencie in the* Duodenum. *Which is apparent in the Diſſection of living Dogs; in whom generally there is a ſpumous Humour boyling in the ſaid Inteſtine, which is raiſed by the Acidity of the pancreatic Juice, and the mixture of Choler, abounding in Volatile and fixed Salt.* Which is that very thing which Chymical Operation teaches us; *viz.* That acid Spirits meeting with the lixivious Salt, always fall a boyling if there be nothing intermix'd to prevent the Operation. Now that in Choler there is contained a lixivious Salt beſides the oily ſulphury Parts, is hence apparent, for that both may be ſeparated from it by chymical Art. And then the Taſt diſcovers the moderately ſharp Acidity of the pancreatic Juice; and moreover for that being put into ſweet Milk, it preſently curdles it, even as Vinegar and other ſharp Juices do. Laſtly, for a farther Proof of that Efferveſcency occaſioned by the mixture of Choler with the pancreatic Juice, we will add the twice repeated Experiment of D. *Schuylius*, *Tract. de Vet. Medicin.* *The Abdomen of a live Dog,* ſaith he, *being opened, I ty'd the Duodenum with a String, not far from the Pylorus; and with another String a little below the Inſertion of the pancreatic Ductus, and ſo left the Dog, having ſow'd up the Abdomen again. Three Hours after, the Dog being ſtill alive, and ſtrong, for he had loſt very little Blood, the Abdomen being opened again, we found the Space between the two Ligatures ſo extreamly diſtended, that it would not yield to the Compreſſion of the Fingers, but threaten'd a Rupture, nor did we find the Dogs Gall-bag leſs diſtended. A moſt intenſe and burning Heat alſo ſcalded that intercepted Part of the Duodenum; in which, when I had made a little Wound with a Lancet, together with the Humors contained therein, great ſtore of Wind brake out with the uſual Noiſe and ratling of breaking Wind; from whence alſo, a ſowre kind of Smell offended the Noſes of the ſtanders by; which when the Gut was more opened, none of the Spectators could endure. Which was a manifeſt Argument, that there had not only flow'd thither ſuch a Quantity of Choler, and pancreatic Juice, but that there was an Efferveſcency raiſed in 'em, not a mild and moderate one as in ſound People, but extreamly vehement. For not only that part of the Inteſtin was full, but diſtended extraordinarily by a violent force and ruſhing of the Blood and Spirits. Nor was it probable that that part of the Duodenum could have bin ſo diſtended, nor that the Vapors, Exhalations, Humors, and Wind, could have bin diſſipated with ſo great a Force, but by the Efferveſcency and Agitation of Particles quite contrary to thoſe Humors. Some few days after I repeated the ſame Experiment, in the preſence of ſeveral Students; and within two Hours or little more, that Portion of the Inteſtin ſwell'd very much, but did not burn ſo violently: But having opened that ſwell'd Portion of the Inteſtin, which I had ty'd before, frothy Bubbles brake out with a loud noiſe, with which that Space of the Gut was diſtended. So that it is not for Impudence it ſelf to raiſe any more Doubts concerning the Truth of this Efferveſcency.*

CHAP. XI.

Of the Meſenteric Milkie Veſſels.

I. THE *milkie Veſſels conveighing the white* Chylus *from the Guts through the Meſentery, were firſt diſcovered in our Age; and*

And in the Year 1622, *by* Gaſpar Aſellius, *Anatomiſt of* Padua. *I ſay in our Age, for that* Hippocrates *and others had ſome obſcure Knowledg of 'em.* *Galen* alſo ſaw 'em and obſerv'd 'em; but he believ'd 'em to be Arteries, and ſway'd by that Error, affirm'd that the Orifices of the Arteries reaching to the Inteſtines, receiv'd ſome ſmall Quantity of Nouriſhment, appears *l.* 4. *de Off. Part. c.* 17. & *l.* 3. *de natural. Facult. c.* 13. & *lib. an Sang. in Art. content. c.* 5.

The Name. II. Aſellius *was the firſt that gave 'em the Name of* milkie Veins. *But in regard they carry no Blood, and for that their Subſtance is far different from that of the Veins, as being much more tranſparent and thinner, we thought it more proper to call 'em* milkie Veſſels *for better diſtinctions Sake.*

The Deſcription. III. *They are thin tranſparent Veſſels covered with a ſingle Tunicle, ſcattered through the Meſentery, infinite in number, appointed for conveighing the* Chylus.

The Original. IV. *They take their Original from the Guts (the chiefeſt Part from the Jejunum and other ſmall Guts, among whoſe Tunicles, with ſeveral ſmall and ſlender ends of Roots they open into the inner Hollowneſs of the Inteſtines, their Orifices lying hid, under a ſpungy kind of Slime, into which the* Chylus *is ſqueezed by Compreſſion of the ſaid Guts, and from whence it is received by the gaping Veſſels.) From hence, with an oblique Paſſage, they aſcend the Meſentery, by the way interwoven one among another, and variouſly confuſed, and ſo proceed forward between and thorough many little Glandules, chiefly thoſe that are placed at the Separation of theſe Veſſels, toward the great or middlemoſt Glandule of the Meſentery, into which a very great number enter, and a many croſs over the Superficies of it, and afterwards end at the great Receptacle of the* Chylus, *abſconded under that great Glandule.* But they never enter the Liver, as ſome with *Wuleus* and *Gaſſendus* endeavour to perſuade us. Neither do any of 'em open into the *Vena Porta*, the *Vena Cava*, or *Meſenteric Vein*; tho' *Lindanus*, following *Waleus* (*l.* 2. *Phyſiolog. c.* 5.) aſſerts that Miſtake. Nor are they ever continued with the *Meſaraic* Veins, as being Slips of them, which was a Figment of *Deuſingius*. Nor ever were any ſeen to proceed from the Stomach.

How they paſs the Glandules. V. Wharton *obſerves in his* Adenographia, *that thoſe Veſſels in their Entrance into the Glandules, or a little before, are divided and ſubdivided into ſeveral little Branches, and ſo are quite obſcur'd in the very Subſtance of the Glandules, and after they have ſo in a manner diſappear'd in the very middle of the* Glandules, *preſently new Strings of the ſaid Veſſels ſpring out again, from the very Body of the ſaid Glandules, which meeting together form a Trunck as before, and being carried toward the Beginning of the Meſentry, aſſociates to it ſelf other Branches of the ſame kind meeting with it, and is by them enlarged.* Thus without doubt, thoſe Veſſels that enter the great Glandule, ſpring out of it again as from a new Root, and into the Receptacle of the *Chylus*.

Their Valves. VI. *They have many* Valves *which admit the Entrance of the Chylus from the Guts, and hinder its Return, which tho' they cannot be eaſily demonſtrated to the Sight, by reaſon of their extraordinary ſmallneſs, yet thus are they eaſily apprehended; that is to ſay, if theſe milkie Veſſels are preſſed toward the great Glandule, they preſently grow empty:* And *Fredric Ruiſch*, a Phyſician formerly at the *Hague*, now at *Amſterdam*, and a famous Diſſecter, had publickly ſhewn 'em, and cauſed 'em to be engraven in his Plates: But if the ſame Compreſſure be made from the Kernel toward the Guts, the *Chylus* ſtops, neither can it be thruſt forward. Which is the reaſon that in Dogs and other Creatures well fed, that are diſſected alive, or hang'd three hours after they have fed, theſe milke Veſſels appear ſoon after very numerous and full of Juice in the Meſentery: But while the Guts are ſtirr'd and mov'd up and down by the Anatomiſts, together with the Meſentery annexed for Demonſtration ſake, that milky Juice is ſqueezed out of 'em by that Motion, and flows to the Receptacle of the *Chylus*; and ſo theſe

ſmall

ſmall Veſſels in the Meſentery vaniſh as it were from between your Fingers, and eſcape the Sight, when being empty'd, by reaſon of their thinneſs and tranſparency, as has bin already ſaid, they can no longer be diſcern'd.

Their Uſe. VII. *The uſe of theſe milkie Veſſels, is to conveigh not the Blood, but the* Chylus *from the Guts to the great Glandule of the Meſentery, and thence to the Receptacle of the* Chyle. And this the whitiſh Colour of the contain'd Juice teaches us, which in a Creature kill'd three or four hours after feeding, is like the Cream of Milk, and diſappears when the Diſtribution of the *Chylus* is at an end, nor does the Blood ever ſucceed into its Place, and ſo the *Chylus* being evacuated, theſe pellucid and ſmall Cobweb-lawn Veſſels, for want of that milkie Colour almoſt eſcape the Sight, which is the Reaſon why they have layn undiſcovered for ſo many Ages. I ſay *almoſt*, in regard that to theſe that look narrowly, they remain conſpicuous in the form of little Fibres. Which deceiv'd *Galen* and ſome others, who took theſe little Fibres for Nerves or very ſmall Arteries.

A Proof. VIII. *Now that the* Chylus *is carried through theſe Veſſels from the Guts to the Receptacle, is apparent from hence, for that if in a living Animal well fed, and ſuddainly diſſected three hours after, they be ty'd in the middle, there will happen a ſwelling between the Ligature and the Gut, and a lankneſs in the other Part.* And the ſame is alſo manifeſt from the Situation of the Valves, of which we have already ſpoken.

The impulſive Cauſe. IX. *The cauſe why the* Chylus *enters the milkie Veſſels, and is forced through thoſe, is twofold. The one more feeble: a kind of rowling Contraction perform'd by the Fibres of the Guts themſelves, which Contraction is conſpicuous in Cats and Rabbets diſſected alive. The other is ſtronger, powerfully aſſiſting the former, an Impulſe of the Muſcles of the Abdomen mov'd upwards and downwards by the Act of Breathing:* By which the *Chylus*, and conſequently the thin and moſt ſpirituous Parts of the Nouriſhment concocted in the Stomach, and fermented by the mixture of Choler, and the Pancreatic or Sweet-bread Juice in the Guts, being ſeparated from the groſſer and more crude Maſs, are forc'd out of the Guts into the gaping Orifices of the milkie Veſſels. Which Orifices, by reaſon of their extream Narrowneſs, will not however admit the groſſer Parts; and hence it comes to paſs, that being ſeparated from the thin *Chylous* Parts, and forced to the thick Guts, they are exonerated through the Fundament as unprofitable Excrements.

X. *From what has bin ſaid, it appears that theſe Chyle-bearing Veſſels, do not always conveigh the* Chylus (*for they are often found empty*) *but only by Intervals:* That is, ſo ſoon as the *Chylus* is perfected in the Stomach, and deſcends from thence to the Inteſtines.

Whether the Chylus *be attracted.* XI. Deuſingius *in his Treatiſe* de motu Chyli, *believes that Expulſion only is not ſufficient; and therefore he adds to it Sucking or Attraction, the neceſſity of which he endeavours to prove by theſe Reaſons. If there be no Attraction* (ſays he) *but that all Motion muſt be referr'd to Impulſions, how ſhall we think that the Nouriſhment enters from the Mother into the Umbilical Veins, or by what Cauſe can it be forc'd thither? Or how does the Alimentary matter in an Egg reach to the Heart of the Chicken? Unleſs by Attraction, by means of the Motion of Rarefaction, and the Reciprocal Diſtenſion and Contraction of the Heart.* But theſe Reaſons are not of Force enough to defend and eſtabliſh the ſaid Opinion. I anſwer therefore to both, That no Nouriſhment enters immediately from the Mother into the umbilical Veins; but that as well the Blood, as the milkie Juice, by the Impulſe of the Mother is forced from the Womb only into the *Uterine Placenta* (as ſhall be demonſtrated more at large *c.* 30. of this Book) and thence by the Impulſe which is cauſed by the umbilical Arteries from the Heart of the Birth toward the ſaid *Placenta*, the Blood of the Mother that lies therein, being rarify'd and concocted by the arterious Blood of the *Embryo*, is forc'd into the umbilical Vein, and the *Chylus* alſo is forc'd along into the *Vaſa Chylifera*, that tend to the Concavity of the *Amnion*, or Membrane that enfolds the Birth. If

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any one enquires how the rarify'd Juice enters the *Embryo*, before the Navel be grown to its just Magnitude, and how such a Motion of the Heart is caus'd by its Arteries? I answer, That that Ingress is caus'd by a kind of sliding or slipping into it; but there is a great difference between attraction and slipping into a thing. For a hard, heavy, dry, or any other such kind of Substance is attracted, that cannot follow of it self, and sticks to the thing that draws it: but a soft and fluid thing slides or slips in; which finding a lower evacuated place, can neither contain it self, nor subsist in its place, but slides in of it self without attraction. As for Example; If the Water next the Mill is cast upward by the Water-Mill, the subsequent Water cannot be said to be drawn by the Mill, which is sufficiently distant from it, nor is any way joyn'd with it, but not being able to support it self, slides voluntarily down to the empty space. And in this manner the *Liquation* of the *Chylus* slips into the *Embryo*. For while the Heart continually makes Blood of the Matter that daily offers it self, and forces it away from it, presently the Particles of the adjoyning *Liquation* or dissolv'd Nourishment, slip of their own accords into the empty Pores, and supply the *Vacuum*. So that there is no attraction of the Nourishment in the *Embryo*. And the same is to be said of the Chicken in an Egg, into which the Alimentary Nourishment enters, partly by slipping, partly by the Impulse of the Heart of the Chicken.

Whether the Chylus be attracted.

CHAP. XII.

Of the Ductus Chyliferus *of the Breast, and the Receptacle of the* Chyle.

The Description.

I. *This* Chyliferous Ductus *of the* Thorax, *is a Vessel extended from the Region of the Loyns all the length of the Back-bone, to the* Subclavial Vein, *lying under the short Ribs; through which the* Chylus *being pour'd into it, out of the Milkie Mesenterics, together with the* Lympha *or pellucid Water, is carried to the* Subclavial Vein. But because the Passage of the *Chylus* through it is not continual, hence some, not without reason, have thought that this Vessel ought to be more properly call'd *Ductum Lymphaticum Magnum*, the Great Lymphatic Chanel; for that as soon as the *Chylus* vanishes, it is found to be re-supply'd by the *Lymphatic Water*.

The Great Lymphatic Chanel.

The Discoverers.

II. *The first Discovery of this is ascribed to* John Pecquet *of* Diep, John van Horn, *a famous Anatomist of* Leyden, *both which discover'd it in the Years* 1650. *and* 1652. *neither being private to what the other had done; and in our Time publickly shew'd it, and caus'd it to be engraven in their Plates.*

But altho' we are much beholding to 'em for their Diligence for restoring to the great Benefit of Physic, the knowledge of this Vessel, which had lain bury'd in darkness for almost a whole Age, through the negligence and unskilfulness of Anatomists, for rendring the knowledge of it more perfect, and making it apparent by publick demonstration, and all this without any Information beforehand; yet are they not to assume to themselves the whole honour of the first Invention. For above a hundred years ago this very Passage was first observ'd and taken notice of in the Dissection of Horses, by the most famous Anatomist *Bartholomew Eustachius*, who *Lib. de Vena sine pari, Antigrdm.* 13. writes thus: *In those Creatures*, (says he) speaking of Horses) *from the great sinister Jugal Trunk, where the hinder seat of the Root of the Internal Jugular Vein appears*, (he believes it to be the Subclavial, where the Jugular enters it above) *a great Root springs forth, which, besides that it hath a Semicircular Orifice at its beginning, (clearly designing a Valve;) there is also another Root, full of a watery Humour, and not far from its Original, divided into two parts, which meeting in one Stock again that spreads no Branches, near the sinister side of the Vertebra's, penetrating the Diaphragma, is carried downward toward the middle of the Loyns, where becoming broader, and embracing the great Artery, it concludes in an obscure ending, which I have not as yet so well found out.* From which words it is apparent, that this Passage was first discover'd and observ'd by *Eustachius*, but the use of it was not rightly understood. For he describes the Beginning of it from the *Subclavial* Vein, where the End is; and the End in the Loyns where the Beginning is: So that we are beholding to *Eustachius* for the first, but ruder detection;

but to *Van Horn* and *Pecquet* for the more accurate and perfect knowledge and demonstration of it.

III. *But tho' there may be one continued Chanel from the Loyns to the* Subclavial *Vein, yet because it has a broad capaciousness at the beginning, like a little Bag, first receiving the* Chylus *out of the* Mesenteric *Vessels, it is excellently well distinguish'd into the* Receptacle of the Chylus, *and the* Ductus Chyliferus.

The Receptacle of the Chyle.

IV. *The* Receptacle of the Chylus *is the Original of this Chanel, more capacious than the Chanel it self, and is a kind of a little Cell, seated in the Loyns, into which the* Chylus *first flows out of the* Mesaraic Milkie Veins, *and is collected into that as into a Common* Receptacle, *which was the reason that* Pecquet *first call'd this little Cell by the name of the* Receptacle of the Chyle. Which nevertheless *Van Horn* would rather have call'd by the name of the *Little Milkie Bag.* This *Bartholinus* calls the *Milkie Lumbar Glandule*, but erroneously, in regard the Substance of it has no Resemblance with the Substance of the *Glandules. Walter Charleton* calls it by the name of the *Pecquetian Conceptacle*, from the Discoverer. But in regard it receives as well the *Lymphatic Water* pouted forth from the Glandules of the adjacent Parts, as the *Chylus* it self (for in a live Creature, if you squeeze out the *Chylus* with your Thumb, it is presently fill'd with *Lymphatic Water*) it may be no less properly call'd the *Receptacle of the Lympha*, as well as the *Chylus*, and so much the rather because the *Chylus* only flows into it at such and such Intervals, but the *Lympha* fills it continually.

The Receptacle of the Lympha.

V. *The Seat of this Receptacle is under the* Cœliac *and Emulgent Veins, almost in the middle Region, between the Muscles* Psoas, *the Kidneys and the Renal Glandules, which, together with the Kidneys, it touches by immediate Contract, so that there can hardly be separated with a Penknife certain little Branches running between.* Yet in all Creatures it does not exactly keep the middle place of the Loyns, but in Beasts most commonly inclines toward the left side, near the hollow Vein descending, close to the left Kidney, seldom turns to the right side, or keeps directly in the midst of the Lumbal Muscles.

The Number.

VI. *In Brute Beasts this Vessel is generally single, with one Cavity; sometimes twofold; that is, one in each side. Sometimes one, with a little Membrane going between, as it were distinguish'd into two Cells.* Moreover, sometimes three of these Vessels have been said to have been found, two in one, and one in the other side; which is more than we have ever met with as yet. *Bartholinus* has observ'd three in a Man; two of a bigger size, set one upon another, but conjoyn'd with mutual milkie little Branches, seated between the *Cava* descending, and the *Aorta* Veins, in an Angle, which the Emulgents make meet with the *Vena Cava.* The third somewhat higher, and nearer to the *Diaphragma*, and losing it self in its Nervous beginning under the *Appendix.*

The Shape.

VII. *The shape of this Receptacle is for the most part round, and somewhat compress'd; but many times Oval.*

The Bigness.

VIII. *It varies in Bigness: Frequently it fills the space between the Lumbar Muscles, extending it self to the Kidneys and their Kernels.* In Brutes we find it sometimes a little bigger, somewhat extended toward the lower parts.

The Wideness,

IX. *The inner Cavity, the* Chyle *being taken out, sometimes equals two Joynts of the Fore-fingers, sometimes only one of those Joynts; sometimes it will hardly admit the top of the Finger.* In Men the Cavity is less than in Beasts; But the Substance of the little Bladder is much more solid, as being very thin, smooth and soft in Brutes, in Men thicker.

Ductus Chyliferus *of the Breast.*

X. *From the upper part of the Receptacle rises a Branch somewhat broad, call'd the* Ductus Chiliferus *of the Breast, or the* Great Lymphatic, *consisting of a thin and pellucid small Membrane, like the Receptacle, leaning upon the Back-bone about the middle below the great Artery, covered with the thin skin that covers the Ribs, and winding somewhat toward the right side of the Artery, where it is more conspicuous in its lower part, the Guts being remov'd to the right side, with*

with the Mesentery *and the* Diaphragma *cut off. Hence proceeding farther upward under the Great Artery, about the fifth and sixth Verteber of the Breast, it turns a little without the Great Artery toward the left side, and so between the Intercostal Arteries and Veins, ascends to the sinister* Subclavial, *into which it opens in the lower part or side, in that part where the sinister Jugular enters into it in the upper place.* But at the entrance it does not open into it with a wide Gaping, but with six or seven little small Holes, covered over together with a little broad *Valve* in the inner Concavity of the *Subclavial Vein*, which *Valve* looks from the Shoulder towards the *Vena Cava*, where is appointed the Ingress of the *Chylus* and *Lymphatic Juice* out of the *Ductus Chyliferus* into the *Subclavial Vein*; but the Return of the same Juice, and of the Blood also into the said Chanel out of the *Subclavial Vein*, is prevented.

Two Chanels. XI. *Sometimes two Branches, somewhat swelling, ascend from the Receptacle, which nevertheless we find united below in the middle under the Great Artery, as if there were but one Chanel only in the upper part.*

Two or more Receptacles of the Chyle. XII. *In Human Bodies sometimes, tho' very seldom, there are to be found two or three Receptacles of the* Chylus, *and from each arise particular* Ductus's, *which being united in their Progress, at length with one* Ductus *proceed to the left* Subclavial Vein.

The Insertion. XIII. *Their usual Insertion is into the left* Subclavial Vein, *as well in Men as in Beasts; but very rarely do Anatomists observe the Insertion into both* Subclavial Veins. *Whence I judge that it is scarce to be found in one Beast of an hundred.* Thus *Bartholinus* reports that he found the Insertion of the *Ductus Chyliferus* into the left *Subclavial Vein* in the Dissections of six Men and several Beasts, and once only in a Dog its Ingress into the right *Subclavial* also. *Pecquet* observ'd two Branches ascending upwards, joyn'd here and there together in the Mid-way, with several parallel little Branches, and meeting together at the third *Verteber* of the Breast, and then divided again, of which one entred the right, the other the left *Subclavial.*

Its Valves. XIV. *In the inner part, this Chanel has many* Valves, *preventing the Return of the* Chylus *and ascending* Lymphatic Juice, *sufficiently manifest from hence, because the* Chylus *contain'd in it may be easily forc'd upward by the Finger, but by no means downward*; and for that the *Ductus* being bor'd thorough in any part, the Milkie Juice tending upward from the lower part, flows out; but in the upper part, above the little wound, stays within the *Valves*, nor will descend to the wound made in the Chanel. Moreover, for that the Breath blown into it, through a small Pipe thrust into it; or Liquor injected into it through a Syringe, easily ascends upward, but cannot be forc'd downward.

The way to discover it. XV. *The Discovery of this* Ductus Chyliferus *belonging to the Breast, is not always equally to be made with the same easiness, for that because its Tunicle is pellucid, and lyes under the inner cloathing of the Ribs, it is not so easily obvious to the sight, especially if it be empty of* Chyle, *as frequently it is some hours after Meals, or after Fasting: but it presently appears when it swells with a whitish* Chylus. And therefore it presently shews it self in live Dogs, or strangled three or four hours after a full Meal. And then also the Ingress of the *Milkie Mesenteric Veins* into the Receptacle of the *Chyle*, from the great Glandule of the *Mesentery*, manifestly displays it self. *Bartholinus* writes that he readily found this Chanel with the Receptacle in the Bodies of two men newly hang'd, that had fed heartily before their deaths. In such as lye sick, and dye of the Disease, it is hard to be discover'd, as being empty of *Chylus*, for that sick People eat very little, especially when Death approaches, and that their Stomach makes hardly any *Chylus* out of the Nourishment receiv'd. Nevertheless in the Year 1654. I found it in two Persons that dy'd through the Violence of the Disease, and shew'd it to some Students in Physick. First in *April*, in the Body of a Woman emaciated by a long Disease, but while she liv'd, very thirsty. In which Body, the next day after the Woman dy'd, I found it swell'd with Serous and Lymphatic Humour, and shew'd it to the Spectators that were present. The second time was in *May*, in the Body of a Woman that dy'd of a

Pleuriſie, in her right ſide, and in her life time, provok'd by continual thirſt, had drank very much: and for that reaſon, both the Receptacle and this *Ductus* were very much ſwell'd with Serous Humours. But in both Bodies I found the Situation of the Chanel to be ſuch, as it us'd to be in Dogs, and that its Inſertion was into the *ſiniſter Subclavial*. Only in the firſt Body the *Receptacle of the Chylus* was ſmall, in the latter more large, as admitting into it the whole Joynt of the Thumb. Afterwards we have ſearch'd for, and found this *Ductus* in ſeveral Human Bodies, tho' we have found ſome variety as to the Receptacle, as ſometimes that there was but only one, ſometimes that one diſtinguiſh'd or divided with a ſmall Membrane in the middle; ſometimes by reaſon of a double protuberancy, they ſeem'd to be two diſtinct Receptacles: and ſometimes that out of this one *Ductus* very ſeldom two aroſe; which afterwards clos'd together in one. But hitherto we never found in Men the Inſertion of this *Ductus* into the *right Subclavial*, but always into the *left*.

XVI. ***But whether the*** Ductus Chyliferus ***ſends any Branches to the Breaſts and Womb, we ſhall inquire in our Diſcourſe of the Womb and Teats.***

Lewis de Bill's *Circle.*

While we were writing this, came forth in Print a ſmall Dutch Treatiſe of *Lewis de Bills*, wherein he boaſts to have found out a much further Propagation of the Lactiferous aud Chyliferous Veſſels. For he writes, and gives you the draught of it in a Plate annexed, that the *Ductus Chyliferus* belonging to the Breaſt, makes a wreath'd Circle to the Diviſion of the Jugular Veins (which afterwards ſome rather chuſe to call the *Labyrinth*, others the *Twiſted Turning*) and that two little Branches ran from it to the Glandules of the Teats, and two aſcended further upwards to the Glandules of the Neck. For my part, I have ſeveral times ſearch'd for the Continuation of this Contorted Circle with the *Chyliferous Duct* of the Breaſt, but could never bring or follow this Chanel farther than the *Subclavial Vein*. Nevertheleſs, underſtanding by report of others, that the ſaid Circle could not often be found, yet that it was ſometimes diſcover'd by *Steno* and others, I order'd my Diſſections of Dogs after another manner, that is, from the upper part of the Throat to the *Sternum* or Breaſt-bone, and upon ſeveral diligent Inquiſitions after this Circle, ſometimes I found it manifeſtly conſpicuous, eſpecially if it were blown up; for ſo it became moſt obvious to the View of the Spectators. At other times I found nothing elſe, but only a various Concourſe of ſeveral Lymphatic Veſſels, taking their Riſe out of the Jugular Glandules, the Glandules behind the Ears, and others adjacent thereto, and thence running out to ſeveral Veins, and then diſcharging it ſelf into them. In the mean time I obſerv'd this alſo very accurately, That this Concourſe of ſmall Lymphatic Veſſels, was not continu'd with the *Chyliferous Duct* of the Breaſt, nor receiv'd the *Chylus* from, or carried it farther to the Glandules that lye round it, as *Lewis de Bills* erroneouſly aſſerts; but quite the contrary, that that Lymphatic Juice was carried from the ſaid Glandules to that Lymphatic Circle or various Concourſe of ſeveral Veſſels (I ſay *various*, becauſe it is not always the ſame in all Bodies) and thence by means of ſeveral little Branches ſpreading farther, is emptied into ſeveral Veins, as the Glandules of the Armpits and Groins, by means of their Lymphatic Veſſels, exonerate their Lymphatic Juice for the moſt part into the Milkie Veſſels.

XVII. ***But tho' this Circle has appear'd to us now and then, and other times not at all; yet it is manifeſt that ſome could never diſcover it.*** For of late their came to our hands, the *Anatome* of the *Bilſian Anatome*, by *Jacob Henry Paulus* Royal Profeſſor in the Academy of *Hoppenhaghen*, wherein that Learned Perſon utterly explodes the ſaid *Bilſian Labyrinth*, as a meer Fable, becauſe he could never find it, but only ſome kind of Concourſe of ſmall Lymphatic Veſſels, as aforeſaid. His words are theſe, *L. 6.* of the ſaid Book: *The new Chylifer Chanel*, ſays he, *which* D. John van Horn *has firſt divulg'd*, (he means the Pectoral Chanel) *when it leaves the Breaſt, does not again aſcend toward the Throat, or come to be taken notice of again: And the wreathed Receptacle of* Bilſius, *with its Windings, Turnings, Pipes, Branches and ſmall Twigs, is nothing elſe but the Propagations and Excurrencies of the Lymphatic Jugular Veſſels from the upper Glandules to the Glandules of the Armpits, and this on both ſides. Wherein Nature ſports her ſelf after a wonderful manner, in the ſame manner as in the Veins of the Hands and Feet, and which have been obvious to me at ſeveral times in ſeveral varieties. But generally they kept this Order, that the* Ductus *proceeds alone by it ſelf from the Oblong Glandule*

of

of the Jaw, where it lyes between the huddle of the Parotides, *and* Wharton's *Glandules at the lower Seat of the Larynx, call'd* Thyroidæ, *accompanied sometimes with three or four small Branches, which often close with another Branch, proceeding from the lesser Glandules, which adjoyns to the* Caroidal *Artery, and the Internal Jugular Vein, tho' not always. This* Ductus *then forsaking the Gullet, over which it is spread, associates it self to the External Jugular Vein, and creeping under it, sometimes crosses over, sometimes passes by two other Lymphatic Vessels, which proceeding from the Glandules of the Neck, in the middle of the Neck mutually embrace and bind each other, and are the occasion of many Branches, but no proper Circle, unless a man will fancy it so to be. And therefore that famous Circle is a meer Labyrinth, and an inextricable Errour. But all those Propagations of Vessels, when they have once reach'd and pass'd the Branch of the External Jugular (to which frequently adjoyns a small Glandule also) proceeding from the Muscle that bends the Head or* Mastoides, *fall into a common* Ductus *like a Glass Viol, with a wide Belly, and as it were blown like a bladder, so that it might not improperly be call'd a Receptacle by* Bilsius. *From which, at length, double Appendixes extend themselves, of which the one enters the Armpit Vein, near the Pipe of the rough Artery, in the place where the Carotidal Arteries arise from the Trunk: the other at a little distance enters the External Jugular: To which another Lymphatick Vessel (which hitherto Anatomists have deriv'd originally from the Joynts) joyns it self from the Subaxillary Glandules. So that there happens a meeting of several Insertions, that is below, of the Pectoral* Ductus (an Error; for that never passes beyond the Subclavial Vein) *from the side of the Axillary Vessels; above, of the Lymphatical Jugular Vessels, and Vessels arising out of the* Thymus, *which is one of the Jugular Glandules, but seldom any passing of one into another.*

XVIII. *This Description the same Author, in a new Plate annex'd, apparently demonstrates, and in the same seventh Chapter, adds the way to find out the Jugular Lymphatics.*

But tho' the foresaid Doctor *Paulus* wittily enough derides *Bilsius*'s Circle, yet is it not probable that *Bilsius* at his dissection should delude so many Learned Men that were present, into that Blindness and Madness, as to testifie in a Public Writing, that they saw such a Circle clearly by him demonstrated, which was not really there to be seen: Could they be all so blind? Besides, we our selves, and several others, have seen this Circle, tho' we could not always find it. Which we the rather believe may happen through the Sport of Nature, in regard that in some Dogs the Circle is found to be perfect; in others only a disorderly Concourse of Lymphatic Vessels about the Throat. To conclude then, I assert this in the mean time, That this Circle is no Production of the *Thoracical Ductus Chyliferus* (as *Bilsius* erroneously avers and delineates) and that, as has been said, it receives no *Chylus* from it, nor carries any *Chylus*, but is a Chanel into which the Lymphatic Juice, being carried from the Circumjacent Glandules, and other parts, and to be conveigh'd into the neighbouring Veins, and other parts, is collected together.

Now whether the *Chylus* and *Lymphatic* Humour be one and the same thing, or whether distinct Juices. See *Chap.* 13. following.

The use.

XIX. *The use of the* Chyliferous *or* Great Lymphatic Pectoral Ductus, *is to conveigh the Lymphatic Juice continually, and the* Chylus *at certain Intervals, being forc'd out of the Milkie Mesaraic Vessels, and attenuated therein, by the mixture of the Lymphatic Juice, to the* Subclavial Vein, *to the end the Lymphatic Juice may prepare the Blood to cause an Effervescency in the heart, and that the* Chylus *mixed with the Venal Blood, and carried together with it through the* Vena Cava *to the Heart; may be chang'd by that into Blood.*

The ascent of the Chylus.

XX. *That the* Chylus *and Lymphatic Juice ascends upward, not only the Situation of the* Valves, *but ocular observation in the very Dissection of Animals, sufficiently teach us, by means of a string ty'd about this Chanel; for presently there will be a swelling between the Knot and the Receptacle, and a lankness above the Ligature.* Which Experiment proves successful in a Dog newly hang'd, if when the Knot is ty'd, the Guts, together with the Mesentery, be lightly press'd by the hand, and so by that Compression the *Chylus* be squeez'd out of the *Chyliferous Mesaraic Vessels* into the Receptacle, and out of that into the Pectoral *Ductus.*

XXI.

XXI. *Now that the* Chylus *enters the* Subclavial Vein, *together with the Lymphatic Juice, and thence is carried to the Heart through the* Vena Cava, *besides that what has been already said concerning the Holes, is obvious to the sight*; it is also apparent from hence, for that a good quantity of Milk being injected into the *Ductus Chyliferus*, it is forthwith carried into the *Subclavial Vein*, hence into the *Vena Cava* and right Ventricle of the Heart, together with the Blood contain'd in the *Vena Cava*, and may be seen to flow out at the Wound made in the Ventricle.

The impulsive Cause.

XXII. *Now the Cause Impulsive that forces the* Chylus, *together with the Lymphatic Juice, out of the Receptacle into this* Ductus Pectoralis, *and so forward into the* Subclavial Vein, *is the same that forces it out of the Guts into the Milkie Mesaraic Vessels (of which in the preceding Chapter, that is to say, the Motion of the Muscles of the* Abdomen, *mov'd upward and downward with the act of Respiration, which causes a soft and gentle Impulsion of the* Chylus *through all the Milkie Vessels, which impulse is conspicuously manifest from hence; for that if in a living Creature the Muscles of the* Abdomen *be open'd and dissected, and thereby their Motion be taken away, and then the Bowels of the lower Belly be gently squeez'd, presently we shall see the Milkie Juice move forward, and croud through all the Milkie Vessels*; and tho' that Compression has no Operation upon the *Pectoral Ductus*, yet the *Chylus* forc'd into it by that Compression out of the Receptacle, is by that forc'd upward, as one Wave pushes forward another.

Whether the whole Chylus *ascend to the* Subclavial.

XXIII. *Here now arises a Question, Whether the whole* Chylus *ascend through this Chanel to the* Subclavial? *and whether or no also a great part of it do not enter the Mesaraicks, and so ascend to the Liver?* To which, we say, that the whole *Chylus* passes to the *Subclavial Vein*, except that which out of the Chyliferous Bag, by an extraordinary Course sometimes, tho' very seldom flows to the Urine Bladder, (of which see more *c.* 18.) or else in Women with Child, according to its ordinary course flows to the Womb, (See *c.* 30.) or in Women that give suck to the Breasts; (See *l.* 2. *c.* 2.) But *Regius* is of another Opinion, believing that part of the *Chylus* is carried to the Spleen out of the Stomach through the *Gastric* Veins, and part through the *Mesaraics* to the Liver. Of which, the one is refuted by us in the preceding Chap. 7. and the other *L.* 7. *c.* 2. *Deusingius* smartly maintains, that the whole *Chylus* is not carried to the *Subclavial* through the *Ductus Thoracicus*, and confirms his Opinion by these Arguments. *Exercit. de Chylificat. & Chyli motu.*

1. Saith he, *There is no congruous proportion of Nature between the innumerable Milkie Veins scattered through the Mesentery, and the Thoracic Ducts* (which nevertheless are seldom more than one) *conveighing the* Chylus *beyond the Axillary Veins.*

2. *How shall the Thoracic Duct be able, without prejudice, to transmit such a quantity of* Chylus, *carried through so many Milkie Vessels, to the Receptacle of the* Chylus?

3. *So very small a portion of the* Chylus *as is carried through the* Ductus Thoracicus *to the Axillaries and* Vena Cava, *does not suffice to supply the continual waste of Blood, agitated and boyling through the whole Body, nor to repair the continual wearing out of all the parts.*

4. *Seeing there is a great quantity of* Chyle *made, and but very little can pass through the streights of the* Ductus Thoracicus, *where shall the rest of the* Chylus *remain, which between every Meal is not able to pass through the small Thoracic Duct?*

5. *That same largest quantity of the* Chylus, *which in time of Breeding and giving Suck, is carried to the Womb and Dugs, whither is that carried, when the time of Breeding and giving Suck is over, when it is very probable that it cannot pass through the* Ductus Thoracicus.

6. *If the* Ductus Thoracicus *of a live Animal be quickly ty'd with a string, the motion of the Milkie Liquour in the Mesentery is not perceiv'd to be hindered.*

And then he adds the Experiment of *Lewis de Bills*, by which he believes it to be obvious to sight.

These are the principal Arguments by which that Famous Artist endeavours to uphold his Opinion. Now let us examin of what weight they are, and whether they are so ponderous as they promise to be, to the end we may see whether Truth will give her voice for this acute Invention.

XXIV.

XXIV. *I answer to the* first *and* second, *That there is not only a lesser but a greater Proportion between the Milkie Mesenteric Vessels, and one or two Thoracic Ducts, than there is between so many innumerable Veins that proceed from the Head, the Trunk, the Feet, the Arms, and some other Parts, and one* Vena Cava *into which they all evacuate themselves.* For if we consider so many Myriads of Veins, all of 'em may be thought to evacuate into the *Vena Cava* ten times as much Blood, as either the *Vena Cava* can contain, or disburthen from it self. And yet who does not see that it is done without any disorder; and why therefore should we wonder that the same should be conveniently done in the Milkie Vessels? Besides, we must consider that the flowing of the *Chylus* is not so continual; for many times there is a great distance between the two Meals, at what time there is no *Chylus* that is either made or flows (which is manifest to the Eye in Creatures hang'd a long time after they have fed, in which these Vessels are found empty of *Chylus*) and that Men who feed often, or else eat to excess, and therefore neither Concoct the *Chylus* over-hastily, or in over great quantity, so that it ca not swiftly make its way through those Passages, such men are out of order, either because they do not digest the Food they have eaten sufficiently, or for that the quantity of the *Chylus* being too great, cannot pass quick enough through those Milkie Vessels, and therefore by the way, by reason of its longer stay, grows thick, sowre, coagulates, or is otherwise corrupted, which breeds Obstructions, and impedes the Passage of the *Chylus*. Lastly, If we may argue from similitude, we must consider how much serous Humour passes in a little time through the narrow *Ureters*: which, if it may be done with so little trouble in those Vessels, why may not so much pass through the Milkie Vessels, and the *Ductus Thoracicus*?

XXV. *To the* third *and* fourth *I answer, That the portion of the* Chylus *that passes through the* Ductus Thoracicus, *is not so small in quantity, but very copious, as is obvious to the sight.* If a living Dog be quickly open'd four or five hours after he has been well fed, and the Milkie Vessels in the middle of the Breast be cut away, and then the Intestines together with the Mesentery, be alternately and softly pressed by the hand, so they be relax'd (as in Respiration that Compressure is alternately made in healthy and living Creatures) then it will appear what a quantity of *Chylus* passes through that Vessel in the Breast. For in a short time a great quantity will flow forth into the hollowness of the Breast; neither shall any thing be discern'd to flow thither through any other Passages. Moreover, by the singular Observation of *Walæus*, there is wasted every day in a healthy Plethoric Person, very near a pound of Blood. Is it impossible that in a whole days time a pound of *Chylus* should pass through the Milkie Vessels, to restore and supply that waste of *Blood*? In the space of half a quarter of an hour we have squeez'd out above two Ounces by the same way as is before express'd, how much therefore might pass in a whole day: certainly much more may be thought to pass than is wasted, supposing that the *Chylus* were continually present in the Guts, from whence being continually present, and still passing, proceeds the growth and increase of the Body, and the Plethory is caus'd. To this may be added *Lower's* Experiment, cited by *Gualter Needham, l. de Format. Fœt. c.* 1. who in a live Dog having made a hole in the right side of his Breast, tore the Receptacle of the *Chylus* with his Finger near the Diaphragma, and then sewing up the External Wound, preserv'd the Dog alive: nevertheless, tho' the Dog were very well fed, within three days, he dy'd, as being starv'd to death: but then after he had opened the Body, the whole *Chylus* was found to be cram'd into that part of the Breast which was wounded, and the Veins being open'd, the blood was seen to be much thicker without any serous Humour, or Refreshment by any mixture of the *Chylus*.

XXVI. *To the* fifth *I answer, That a great part of the* Chylus *that is wont to be carried through the* Ductus Thoracicus *to the* Subclavial Vein, *during the time of breeding and giving suck, is carried to the Womb and the Dugs, and because that for want of that* Chylus, *which is carried another way, the Womans Body is not sufficiently nourish'd; hence those Women (if they be otherwise healthy) by the force of Nature, become more hungry and greedy, that by eating and drinking that defect may be supply'd, and*

and that in the mean time the Neceſſities of Nature may be furniſhed, which requires Nouriſhment for the Embryo or Birth. But if through any Diſtemper of the Stomach, or of any other Parts, thoſe Women are not ſo hungry, but eat little or leſs than they were wont to do, then they grow weak, by reaſon that the *Chylus* is carried another way for the Nouriſhment of the Birth, and are emaciated almoſt to skin and bone, as we find by daily Experience.

XXVII. *To the* ſixth, *That when the Pectoral Chanel is ty'd, and the Creature lyes a dying, we ſee that the Milkie Meſentery, being partly preſs'd by the adjoyning Parts that lye upon 'em, and partly flagging one upon another, vaniſh by little and little.* This is true; but not becauſe the *Chylus* enters the Meſaraic Veins, but becauſe it is pour'd forth into the *Chyliferous Bag*, and the *Ductus Thoracicus*, which are then dilated and extended more than is uſual by the *Chylus*, and when they can hold no more, then it ſtays about the great Glandule of the Meſentery in the Milkie *Meſaraics*, and may be ſeen therein for a whole day and longer, which could not be, if the *Chylus* enter'd the Meſaraic Veins.

XXVIII. *As for the Experiment of* Lewis de Bills, *which has ſeduc'd too unwarily ſeveral Learned Men into another Opinion, what is to be thought of that, we ſhall tell you* L. 7. c. 2.

Whether the whole Chylus *aſcend through the Meſaraic Veins to the Liver?*

John Swammerdam in his *Miracles of Nature p.* 29. promiſing to himſelf that he will reſtore to the Liver the Office of Sanguification, or of making Blood, affirms, that the whole *Chylus* aſcends through the Meſaraic Veins to the Liver, and that what we ſee in the milkie Veſſels is nothing elſe but a whitiſh lymphatic Juice. And this he proves from hence, for that as he ſays, we find the Blood as it were ſtreaked and mixed with white Lines in the *Meſaraics*, ſometimes as it were mark'd with Spots, and ſometimes he found nothing but pure *Chylus* in 'em; and at length he adds theſe Words; *In the* Gate Vein, *tho' not ty'd, we have often ſeen the* Chylus, *and taken it out of the ſame, and we have ſeen many of the* Meſaraics *fill'd with* Chylus. Now if any Perſon will ſuffer himſelf to be perſuaded into theſe things, let him, for me, I envy him not. But for my part I give more Credit to *Aſellius*, *Pecquet*, *Deuſingius*, *Wharton*, and ſeveral others, but eſpecially to my own Eyes, than to ſuch Writings as theſe: Unleſs *Swammerdam* can prove all that I have nam'd to have bin Purblind, and his own Party the only ſharp-ſighted People in the World. For they that have any Skill in Anatomy are to be perſuaded rather by Demonſtration than by Writing; as be ſuch who have Eyes in their Heads and believe what they ſee. But in regard that *Swammerdam* promiſes to explain theſe things more at large in his *Anatomicis Curioſis* (ſo he calls his Treatiſe which is now in the Preſs) we will there expect a more curious Explanation, in the mean time we will ſtick to our former Opinion. But why the Blood is ſometimes of a bad Colour in the *Meſaraics* we ſhall ſhew *l.* 7. *c.* 2. However *Swammerdam*, to confirm his own Opinion, adds another Argument taken from that which never any one could yet demonſtrate, that the *Chylus* is carried out of the Guts into the milkie Veins of the firſt ſort. But by the ſame Argument will I prove, that the *Chylus* is not carried into the *Meſaraic* Veins, becauſe no Man could ever yet demonſtrate its Ingreſs out of the Guts into thoſe Veins. 'Tis true that *John Horn Epiſt. ad Rolphin.* ſay's he can make it out by Demonſtration, but was never yet ſo good as his Word; tho' if there be any at this day who pretend to do it, I wiſh they would admit me to be a Spectator, and then I may be able to judg of theſe Sayings. Again, No Man could ever yet demonſtrate to the Eye the manifeſt Paſſage of the Seed out of the Teſticles through the different Veſſels into the little ſeminary Bladder: Does this prove that the Seed is not conveighed through theſe Paſſages in living People, becauſe it cannot be demonſtrated in dead Bodys? The Seed conſpicuous in the *Paraſtatæ* or Veſſels affixed to the back of the Teſticles, and the ſeminary Veſſels, without any more manifeſt Demonſtration, ſufficiently prove, that it ought to be conveighed out of the *Teſticles* and *Paraſtatæ* through thoſe Veſſels, ſeeing that the Seed is made in no other Parts out of the *Teſticles*, (as we ſhall ſhew *c.* 22.) and there are no other Paſſages to the ſeminary Veſſels. In like manner when we ſee that the *Chylus* concocted in the Stomach flows no where elſe than to the Inteſtins, and is then conſpicuous with its white Colour, which is apparent from

from those white *Chylous* Stools in the *Cœliac* Fluxes or Loosnes of the Belly, and is also seen to be no less white in the milkie mesenteric Vessels, the chyliferous Bagg, and the pectoral milkie Channel: Nay seeing moreover, that after long Famin the Guts being empty'd of the *Chylus*, it is no longer to be found in the said milkie Vessels, nor does any such white Liquor appear in any other Vessels; What Man in his Wits, by the Dictate of Reason only, will question whether the *Chylus* passes out of the Guts into the *milkie mesenteric Vessels*, and thence are pressed forward to the rest of the milkie Vessels, tho' the first Entrance were never yet demonstrated to the Eye. The Defect of which Demonstration proceeds from hence, that there is such a pressing and moving forward of the Humors and Spirits in the Bowels and other Parts which are entire and endu'd with Life, which no Art can perfectly demonstrate to the Eye in dead, mangl'd, and dissected Bodys. In the mean time how the *Chylus* passes out of the Guts into the milkie mesenteric Vessels, has bin already shewn in the foregoing Chapter. Lastly, what *Swammerdam* writes, That it is only a white lymphatic Juice which is carried through the milkie Vessels, let him, I beseech him, tell that Story to those that know no Difference between the *Lympha* and the *Chylus*, nor can distinguish between those Liquors or Juices.

We affirm and demonstrate that both Liquors pass through the said milkie Vessels, and why the milkie Liquor is mix'd with the lymphatic Juice, we teach a little before in the same Chapter, and in the following 17.

XXIX. *Besides the Passage of the* Chylus *already mentioned, which many maintain to be through the Mesaraics to the* Vena Porta, Riolanus l. 2. Enchir. c. 18. Walæus Epist. ad Barthol. & Maurocordatus l. de mot. & us. Pulm. c. 13. *write, That they have observed the Distribution of the* Chylus *to other Parts; and farther relate that they have taken notice that the milkie Vessels run forward to the very Liver, the Sweetbread, the Trunck of the* Vena Cava, *near the Emulgents, to the* Vena Porta *and Mesenteric, and some others.* But all those learned Men were most apparently deceiv'd by the *lymphatic Vessels*, which they thought to be the *milkie Vessels*, as is apparent from the Text of the forecited Places, and from what shall be said in the following Chapter concerning the Rise and Distribution of the Lymphatics.

CHAP. XIII.

Of the lymphatic Vessels of the Lympha.

I. *THE lymphatic Vessels are thin and pellucid Vessels, conveighing the* Lympha, *which is a thin transparent, and clear Liquor, to the* Vasa Chylifera *and the Veins.* *The Definition.*

II. *The first Discoverers of these were* Thomas Bartholinus, *and* Olaus Rudbech, *between whom there is a very great and sharp Dispute for the Honour of the first Discovery, while each one assumes to himself.* These two in Years 1650 and 1651, searching after something else in dead Bodys, happen'd by chance into the Knowlege of these Vessels, perhaps neither of 'em knowing that the other had made the Discovery, so that both may contend unjustly to ascribe that Honour singly to themselves, which may be equally due to both. However *Glisson* and *Charleton* affirm that these Vessels were discovered and shown at *London* by one *Joliff* an English Man, before they were made known by *Bartholinus*. But *Bartholine* in his *Spicilege*, affirms upon his Word, that he knew that *Joliff* was not born before his Discovery, and that he never knew him either by Name or by Report. *The Discoverers.*

III. Bartholine *gives to these Vessels the Names of* Lymphatic, Watery, *and* Crystalline, *and the Liquor therein contained he call'd by a very proper Name*, Lympha, *from its Clearness and crystalline Brightness.* *Olaus Rudbech* chooses rather to call 'em the watery Channels of the Liver and Glandules. *The Names.*

IV. *They consist of clear and cob-web-like Skin, out of which being brok'n, if the Water happen to flow out, they presently disappear, because their Tunicles are affixed to the Ves-* *The Substance.*

ſels and Membranes that lie under 'em, from which, by reaſon of their extream Thinneſs and Clearneſs, they cannot be diſtinguiſhed.

Their Number. V. *Their Number is not to be numbered, and therefore not to be certainly determined.*

Colour and Shape. VI. *Their Colour is Tranſparent and Chryſtalline: Their Shape Oblong, full of Holes, and hollow like the Veins, but very knotty: Their Breadth but very ſmall.*

Their Valves. VII. *They have ſeveral Valves admitting the* Lympha *into the* Vaſa Chylifera, *and ſeveral Veins, but hindering its Return.* Theſe *Valves* has *Lewis de Bils* moſt obſtinately all along deny'd, till they were ſhown him at the *Hague*, delineated in Plates, and made public in a printed Treatiſe by *Frederic Ruyſch*, a moſt excellent Phyſician and Anatomiſt, who diſcovered 'em bent like a Creſcent, fix'd to the Sides of the Veſſels, and plac'd oppoſite one to another, but much more numerous and thinner than any that are to be met with in the Veins. Which *Valves* may be alſo obſerv'd without any opening of the Veſſels: For the *Lympha* contain'd being preſs'd with the Finger contrary to its proper Motion, is every where ſtop'd by the Valves.

Bils's Error. VIII. Lewis de Bills, *who had call'd theſe Veſſels before the* Dew-bearing-Channels, *finding himſelf convinc'd by Dr.* Ruiſch *as to the* Valves, *preſently invented a kind of Evaſion, and publiſhed it abroad to ſave his Reputation in a little Diſcourſe Printed at* Rotterdam 1668. He diſtinguiſhes between the *lymphatic Juice* and the *Dew*; confeſſing the one to be carried to the Veins and milkie Veſſels through the *lymphatic* Veſſels, which are furniſh'd with *Valves*, and affirms this to have bin found out by himſelf many Years before (tho' how truly, appears by *Bartholinus*'s Anſwer *de experiment. Biſian. to Nich. Zas*, Printed 1661. *p.* 11.) but this he ſays flows through particular little Pipes, conſiſting of very ſmall Fibres woven together, but furniſh'd with no folding Shutters, ſeated among the Veins and Tunicles of the Arteries and lymphatic Veſſels, like a kind of Moſs, with a continued Courſe from the inner Parts to the exterior. An excellent Evaſion indeed, whereby he endeavours to underprop the Truth of his firſt Opinion by certain imaginary little Pipes. I call 'em *Imaginary*, becauſe that as yet never any, tho' but a young Practitioner in Anatomy, who does not eaſily apprehend there can be no ſuch Pipes in Nature, when the Tunicles of the Veins and Arterys ſo cloſely adhere and ſtick one to another, that they are hardly ſeparable by any Art, and that there are no ſuch intervening of Pipes or any other Paſſages to be ſeen, tho' Men had *Lynx*'s Eyes, much leſs demonſtrable: Seeing that in regard of this ſame cloſe ſticking of the Tunicles, many ſharp-ſighted Anatomiſts have queſtioned, whether the Veins conſiſt of one or two Tunicles. Which may be ſaid of the *lymphatic* Veſſels, which ſeem to conſiſt of one ſingle Tunic.

Their Situation. IX. *There can be no certain Situation aſſigned to the lymphatic Veſſels; in regard they are to be found in ſeveral Parts of the Body, and in the Trunck accompanying many Veins, eſpecially the greater, and ſeem to be faſten'd to 'em by little Fibres.* Many are alſo conſpicuous in the Middle, and innumerable in the lower Belly, which do not accompany the bigger Veins. Many alſo are found in the Arms at the ſides of the *Brachial* Vein; as alſo in the Thighs, ſticking to the Iliac and Crural Veins. Some there are that hold that theſe Veſſels are joyned to the Muſcles, but I could never obſerve any in the Muſcles themſelves.

Their Riſe. X. *Concerning their Riſe, there have bin formerly very great Diſputes; but by the ſingular Induſtry of modern Anatomiſts, thoſe Miſts are in a great Meaſure ſcattered. Nicholas Steno*, a moſt accurate Diſſecter, has laboured ſo diligently in ſearch of their Riſe, that at laſt *l. de Muſc. & gland.* he pronounces for certain upon the Teſtimony of his own View, that there is an Intercourſe between all the *lymphatic* Veſſels and the *Glandules*, eſpecially ſuch as are cluſtered together; which to that purpoſe have a kind of Hollowneſs in the Middle, in which that Liquor is collected out of the Body of the *Glandule*, as having a farther Journey to make through the lymphatic Veſſels. Thus alſo *Malpigius*, *lib. de hepat.* writes, that all the *lymphatic* Veſſels, in what Parts ſoever, ſtill every where ariſe out of the cluſtered Glandules, which are found in a thouſand Places of the Body, even thoſe that proceed out of the very Liver.

Which

Which he affirms, as having found those Glandules in the Hollow and Covering of the Liver of a Calf, where the bloody Vessels, and the Hepatic Channel enter it. In like manner *Frederic Ruisch* reports that he has in the Liver of a Man found, as it were, a Chain of Glandules, under the Gall-Bladder, which were hard but mix'd with no Blood.

XI. *A great Number of these Vessels go forth from the Liver, which is manifest to the Sight, tho' no Ligature be made use of, but if a Ligature be made use of between the Stomach and the Liver in that part of the Mesentry which knits the Liver to the Ventricle and Guts; by which Ligature the* Vena Portæ, *with the* Bilarie *shall be comprehended: Then presently (if the Experiment be try'd upon a living Creature) between the Ligature and the Liver, there will be a Swelling of these Vessels, which will more increase if the Liver be gently pressed by the Hand.* But they chiefly arise out of the hollow Part of the Liver, where the *Glandules* aforesaid are principally seated, and some of 'em cross over the Vesicle of the Gall. But whether or no, or how they run through the Substance it self of the Liver, that is not visible to the Eye, nor can it be as yet found out by any Instruments or any other Art. *Glisson, in Anat. Hepat.* searching backward, found that they creep under the *Capsula* of the *Vena Portæ* (which *Capsula* is a Membrane from the *Peritoneum* enfolding the *Vena Portæ*, where it enters the Liver) and that there they hide themselves, nor could he observe any farther Progress; from the Conjecture it might be probable, that they follow the Distribution of the *Capsula*, and *Bilarie* Passage included in the same, and never enter the Substance of the Liver. But to us it seems more likely, that arising out of the clustered *Glandules* seated in the hollow part of the Liver, they presently break forth and shew themselves; and therefore that they neither follow the Course of the *Capsula* and *Bilarie Passage*, nor can be much dispers'd through the Substance of the Liver.

XII. *How* Peequet *has observed tho Egress of the lymphatic Vessels out of the Liver, he himself describes* lib. de lact. Thorac. *of the second Edition.*

Behold, says he, *having slit the Belly of a live Dog, I search for the lymphatic Passages. These being supported by the Trunck of the* Vena Portæ, *after the manner of Ivy, presently shew themselves to the greedy Eyes of those that are called to the Sight. Then after many Encomiums to the eternal Memory of* Bartholine, *seeing some running toward the* Duodenum, *other toward the Center of the Mesentry, like so many Furrows, I bind 'em apart from the* Porta *with several Strings. From the Liver all swelling upon their being ty'd, the other way languid, vanished from the sharpest Eye; then loosning the Knots, the* Lympha *pouring out of the Liver again, through various Springs most worthy to be observ'd, by the means of most evident Vehicles of Aqueducts, it seem'd to creep into the* Sweetbread.

These things has *Pecquet* excellently well observ'd (tho' at that time he knew not the true Rise of those Vessels from the clustered *Glandules* of the Liver) for the *lymphatic* Vessels issuing out of the Liver, through the Duplicature of part of the Mesentery knitting the Liver and Guts to the Back, creep on as well above as below the Sides of the *Vena Porta*, and *Ductus Choledochus*, the greatest part toward the *Mesentery*; and under the *Vena Cava*, near the fleshy *Pancreas* annexed to the Ventricle and *Duodenum*, several with little dispersed Branches pass over a certain *Glandule* lying under the *Vena porta*, and sticking to it in many Bodies (being sometimes one, sometimes two or three, seldom none at all) and thence together with many others, passing beyond that *Glandule*, throw themselves into the Receptacle of the *Chylus*.

XIII. *Now lately that accurate Dissector* Frederic Ruisch, *has observ'd also several* lymphatic *Vessels to proceed from the Spleen, not only from the Superficies, but from the inner Part of it, accompanying the splenic Arteries and Nerves, and sets down a singular Method by which it may be found out* lib. de Valv. Lymph. And farther notes, that they are not equally so numerous in all Creatures of the same Species; and that the Spleen of a Man has fewer than that of a Calf.

XIV. *The same* Ruisch, *in the same Book, writes that he has also* *From the Lungs.*

ſeen lymphatic *Veſſels in the Lungs*. *Bartholin* avers the ſame; and *Olaus Rudbech* has cauſed 'em to be engrav'd in Copper.

XV. *Moreover in other Parts theſe Veſſels ariſe from the cluſter'd* Glandules; *which* Glandules *have this ſpecific Virtue, to imbue the ſaltiſh Particles ſeparated from the* Serum, *by Diſſolution with a ſlight Acidity: For the* Lympha *contains in it ſomewhat of Acid.* They that proceed from the *Glandules* of the Neck, empty themſelves for the moſt part into the *Labyrinth* (of which in the foregoing Chapter) or Concourſe of the *lymphatic* Veſſels ſeated between the jugular Veins. But thoſe that proceed from the *Axillary Glandules* they deſcend, and partly according to the length of the *Vena Cava* are carried to the *Cyſtis* of the *Chylus*; partly in the Mid-way, enter the *Thoracick Chyliferous Duct*, into which is opened a Branch proceeding from the *Glandule* of the *Oeſophagus* or Gullet. Thoſe that riſe out of the Groyns of the Loins, aſcend, and running under the lower part of the *chyliferous* Receptacle, empty their *Lympha* into it, at the Entrance fortify'd with double Folders, preventing the ſlipping of the milky Juice into 'em. Now that ſeveral *lymphatic* Veſſels empty themſelves into the *Receptacle of the Chyle*, is hence manifeſt, if upon the opening of a live Animal, you preſs the *Receptacle* with your Thumb, and ſo empty the *Chylus* out of it. For then it preſently ſwells and is fill'd up again with the *Lympha*.

Their Inſertion into ſeveral Parts.

XVI. *Nor do they open only into the* Vaſa Chylifera, *but alſo into many Veins.* And thus *Nicholas Steno* obſerv'd, that they gape into the *Jugular* and other Veins, and pour forth their *Lympha*. And *Frederic Ruiſch* writes, that it appears to him by Ligature, and the Structure of the Valves, that all the Conveiances of the *Lympha*, which are found in the Lungs, empty their Liquor into the *Subclavial*, *Axillary*, and *Jugular* Veins. Whither they that ariſe out of the Joynts are carried is not yet diſcovered. Some there are who report they have ſeen cluſtered *Glandules* in the Joynts, from whence, no doubt, proceeds the Original of theſe Veſſels; and as to their Inſertion, there is no doubt but that they diſcharge themſelves into the *Vaſa Chylifera*, and into ſeveral Veins.

Their Inſertion in the Veins.

XVII. Lewis de Bils, *out of his Ignorance of the Valves of the* lymphatic *Veſſels, in his Epiſtolary Diſſertation publiſh'd* An. 1659. *deſcribes a quite contrary Courſe of the* Lympha, *through a Miſtake moſt remote from Truth, and ſeems not at all to diſtinguiſh the* Lympha *from the* chylous *Juice.* And the Admirers of *Bils*, chooſe rather to err with him, than to follow the Truth. Among the reſt *Nicholas Zas*, in his Dutch Treatiſe of the *Dew of Animals*; and others who have ſeen the Demonſtrations of *Bils*, believe they have obſerved the *Lympha* to be the ſame thing with the *chylous* Juice contain'd in the milkie Veſſels, and that it is carried out of the Bag, and other *chyliferous* Veſſels to the Liver, and to the *Glandules* of the Groins, Armpits, Jaws, and others, and from them flows alſo to the Spermatic parts, for to moiſten and nouriſh 'em; but that it is not carried from the *Glandules* and Liver to the *Vaſa Chylifera*. Moreover that it only appears thinner and clearer, as being ſtrain'd through the *Glandules*.

Bils's *Error.*

Whether the Lympha *be the ſame with the* chylous *Juice.*

XVIII. *But our Eyes, and Reaſon it ſelf teaches us quite the Contrary.*

The Refutation.

XIX. *Our Eyſight thus: Becauſe that beſides myſelf*, Bartholin, Van Horn, Pecquet, N. Steno *and ſeveral other Sharp-ſighted Perſons could never perceive any other Courſe of this Liquor, than from the Liver, and not from the* Glandules *of the Armpits, Loyns, and Groyns, (and the ſame Reaſon certainly will hold in other remoter Parts) toward many Veins, but chiefeſt of all toward the Receptacle of the* Chyle, *and other* Vaſa Chylifera, *to which it may be eaſily forc'd with the Finger; but cannot be mov'd from them toward the* Glandules *or Liver, by reaſon of the Obſtruction of the Valves.* Nay if in the Diſſection of a living Creature, the Veſſels be ty'd (which has bin often experimented by me and my Scholars) there will be a ſwelling betwen the Knot and the *Glandules*, but a lankneſs and emptineſs toward the *Vaſa Chylifera*. Nor is it of any moment what *Regius* offers, *l.* 4. *Phyſic. c.* 7. *Edit.* 1661. That upon the tying of a Knot, theſe *lymphatic* Veſſels will ſwell beyond the Knot; becauſe the Juice that was wont to be preſs'd into 'em, is not preſſed

prest forward by reason of the Ligature, and hence when they fall, by their falling they squeez the Juice contained in 'em backward toward the Ligature. But wherefore I pray, do they not squeez it forward, seeing that by the same Reason it might far more easily be done than backward? And if that Motion ought to be made forward, why does it not so fall out in Veins that are ty'd, as well as in the *Mesenteric* and *Thoracick* milkie Vessels? Wherefore do not these Vessels, when the farther Progress of the contain'd juice is obstructed by the Ligature, by their Pall squeez the Juice backward toward the Ligature, but are almost quite empty beyond the Ligature? Have they not the same Right and Power, as the *lymphatic* Vessels? Wherefore also, when there is no Ligature, cannot the *Lympha* be forc'd by the Finger from the *chyliferous* Bagg toward the Liver and *Glandules* of the Groyns and Armpits, tho' it may be easily forc'd toward the *Vasa Chylifera*? Why do the Valves obstruct this, more than that Motion of the *Lympha*? Certainly all these things plainly teach us that the *Lympha* does not move from, but to the *chyliferous* Bag, and the *Vasa Chylifera*. In the Liver, or a little below the Liver, the thing is so plainly manifest by the forementioned Ligature, that it is beyond the Contradiction of any Man that has Eyes; whenas there is no *Chylus* strain'd through the Liver, nor any *Chylus* that comes thither, whatever *Regius*, *Bils* and other Asserters of antiquated Learning and erroneous Demonstrations, so vigorously maintain to the Contrary; as shall be more largely prov'd *l. 7. c. 2.* Now then if this happen thus in the Liver, why shall the same thing seem such a wonder in the forementioned *Glandules*, in which the same thing is evident by *Ligature*? Why must the *Glandules* of the Groyns and Armpits make milkie Juice, and not rather extract it out of the *Vasa Sanguifera* themselves, in like manner as we see, that in the Ventricles of the Brain, the small *Glandules* adhering to the *Choroïdal Plexure* (so far as which no milkie or *chylous* Liquor penetrates) extract a *serous* and *lymphatic* Liquor out of the Vessels to which they adjoyn; and discharge it into the Cavities of the Ventricles? However if any Follower or Admirer of *Lewis de Bils*, either will be pleased, or can at any time demonstrate this thing otherwise to us, so as to convince us by seeing it with our Eyes, we shall rest satisfy'd, in the mean time we are bound to believe what we have hitherto seen and now asserted.

XX. *Reason also gainsay's the foresaid Opinion: For that the milkie Juice of the* chyliferous *Receptacle, cannot immediately upon its slipping out of the Receptacle toward the* Glandules, *supposing 'em to be the* Glandules *of the Groyns, changed into this pellucid and clear* Lympha, *and lose all its milkie Colour in a Moment.* But this they say is done, because it is strain'd through the *Glandules* lying in the Mid-way. But there are no *Glandules* where the Insertion of the lower *lymphatic* Vessels into the *Receptacle* of the *Chylus* shews it self. There are two indeed a little lower, but the various *lymphatic* Vessels pass by 'em at such a Distance that they do not so much as touch 'em; so that the *Lympha* contained in them cannot attain its transparent Thinness from such a Straining. Others more studious of Novelty than Truth, that they may by some means or other underprop this new Opinion, assert with *Regius*, that the milkie Juice being infused with Violence into the *Receptacle* of the *Chyle*, becomes Frothy and White, but by Cessation, the Froth ceasing, becomes watery, and flows to the *Glandules*, so coloured like Water: Like brown Ale, which being poured forcibly into the Glass, foams at the top with a white Froth, but let it stand a little, and the Froth turns again to watery Liquor. But how lame this Simile is, is every way apparent. For certainly there is not so much Violence in the Motion of the *Chylus* which should occasion the *chylous* Juice to become white and frothy; for that natural Motion proceeds softly and gently, of which no more violent Motion can ever be felt by a Man, nor discern'd by the Eye in Dissections of living Creatures. So that if it presently loses its white Colour (which they call *Spumosity*) descending from the *chyliferous* Bagg by a short way to the Loins and *Glandules* of the Groins, why does it retain it in a Channel four times as long, ascending to the *subclavial Veins*? Whence has it that whiteness in the Intestines and *milkie Mesaraics* before it is infused into the *chyliferous* Bagg with that feign'd Violence? Wherefore standing quiet in the milkie Vessels, or taken out in a Spoon, by that Sedateness does it not lose its Colour, but still preserve its whiteness? XXI.

XXI. *And thus, whether we consider the* Autopsia, viz. *Ocular Convincement, or* Reason, *the Lymphatic Vessels do not seem to have any other Original than from the cluster'd Glandules, and the Parts by us already mention'd.* And further also, it manifestly appears that the *Lympha* is a Liquor very much distinct from the *Chylus*.

What sort of Liquor the Lympha *is?*

XXII. *After the description of these Chanels or Vessels, let us examine in few words what sort of Liquor the* Lympha *contain'd in 'em is.* For the Opinions of Learned Men are very various in this Matter; and every one advances his own as truest, or at least most probable.

Whether Water.

XXIII. Bartholine de vas. Lymp. Brut. c. 6. *writes that the* Lympha *is a simple Water, being the remainder of the Nourishment, as it is Elementary.* This *Martin Bocdan* (who, *Apol.* 2. *Memb.* 11. *Artic.* 3. agrees with his Præceptor) asserts in Man to be diffus'd between the fat Membrane and the Muscles, but in other Creatures is contain'd under the Skin, and because it does not all transpire through the Skin, therefore that these Vessels were made for its Evacuation. But both the one, and the other, describe a very mean rise, substance, and use of this *Lympha*, when such a simple Water could never be sufficiently expell'd through the Pores only by the heat of the Parts, nor would there be such a necessity for it to be carried inward through the Pores of the Body. If you say that this is requisite for the moist'ning of the Parts, certainly that Office is sufficiently perform'd by the moisture of the Meat and Drink assum'd. Besides, a meer Water never settles into a Gelly, as this *Lympha* will do, if it stand a while in a Spoon.

Whether a Vapour of the Blood.

XXIV. Glisson Anat. Hep. *believes the* Lympha *to be a Liquor consisting of the Vapors of the Blood, gather'd together like Dew, forc'd into these Vessels, and flowing back with the Vehicle of the Nourishment brought through the Nerves.* But this Opinion is confuted by these Reasons; 1. Because such Vapors may easily thicken into Dew or Water, but never like the *Lympha* into a Gelly. 2. For that the Supposition of the Nutritive Juice being carried through the Nerves, is false, and by us *C.* 16. of this Book, and *L.* 3. *c.* 11. and *L.* 8. *c.* 1. sufficiently refuted. 3. Because the Vapours of the Blood, partly insensibly through the Pores, and visibly by Sweat, partly by the Expiration of the Lungs, or else condens'd, may be emptied with the Urine, Stool, Weeping, *&c.* so that if that be all, there is nothing that compells 'em to enter those Vessels.

Whether the Lymphatic Vessels are Veins.

XXV. Backius *does not seem to differ much from* Glisson, *who seems to deduce those Vapours of the Blood out of the Veins into these Vessels; for he affirms the Lymphatic Vessels to be Veins arising from the veiny Trunk.* But in regard there is a vast variety of Substance between them and the Veins, and for that no such Original appears, nor not so much as the least shadow of it, about the veiny Trunk, or *Vena Cava*; seeing also they are never known to arise from any other Veins, but are sometimes inserted into 'em out of the cluster'd Glandules, 'tis to be thought that this Opinion is far from the Truth.

XXVI. George Seger, Dissert. Anat. Artic. 2. *pronounces the* Lympha *to be the Animal Spirits, or to be made out of 'em, which after they are distributed into all Parts through the Nerves, are partly there consum'd and dissipated, and partly congeal into this Water.*

With *Seger* agrees *Francis de le Boe Sylvius*, *Disputat. Med.* 4. *Thes.* 31. and more at large *Disput.* 8. *Thes.* 40, 41. But that this Invention of *Seger* is more Ingenious than True, is apparent from hence, for that the Animal Spirits are such thin Vapours, that there are not the like in the whole Body (for they penetrate with an extraordinary swiftness the narrowest and most invisible Pores of the Nerves) whence it is very likely that they being pour'd forth into the Substance of the hotter Parts, presently do their duty with an extraordinary swiftness; and for the remaining part, by reason of its extream tenuity and volatility, is far more swiftly dissipated by the heat of the Parts than any other Vapours, and much less congeal into Liquor, than any other extravasated Vapours, unless it happen in some colder Parts, as in the Testicles, of which we shall treat *c.* 28. And how suddenly they are dissipated, is apparent from that weariness which follows violent Exercise, or in the suddain Laxation of the contracted Muscles. Moreover, should these Spirits congeal into this Liquor in the Parts to which they flow down, hotter

ter than the Brain, certainly they would much sooner, and more easily, congeal in the Brain and Marrow of the Back, by reason of the greater degree of Cold in both, that is by reason of the Heat which is less in them than in other Parts: but they are never seen to be condens'd in them, neither can such a sort of Liquor penetrate through the Nerves; and if in them they are not condens'd into Liquor, much less in the Parts hotter than the Brain, the heat of which would easily dissipate such thin Vapours. Lastly, a most copious quantity of *Lympha* flows from the Liver and its Glandules, to which nevertheless there are so few, and such slender Nerves that reach, that some Anatomists question their ingress into 'em. Also in the Ventricles of the Brain, from the Choroidal Plexure, a copious quantity of *Lympha*, somewhat thicker, is separated by the small Glandules lying between it, thence design'd to flow forth through the Papillary Processes, and yet there are no Nerves, that enter that Plexure. From whence it is apparent that the *Lympha* is not made of Animal Spirits condens'd.

Whether composed of Animal Spirits and Acids.

XXVII. Bernard Swalve L. de Pancreat. p. 76. *believes the* Lympha *to be compos'd of the Remainder of the Animal Spirits that have lost their Volatility, with somewhat of an Acid Spirit mix'd with it out of the Glandules, and so entring the Lymphatic Vessels. The greatest part of the* Lympha, says he, *is beholding to the Animal Spirit, the lesser to the Acid Spirit.* But what has been already said destroys this Opinion; as also this, that the *Lympha* is continually mov'd through innumerable hollow Vessels in great quantity, whereas so great a quantity of Animal Spirits can never pass in so great a quantity through the invisible Pores of the Nerves, and cannot be carried to the making of the *Lympha*. Moreover, for that a great quantity of *Lympha* breaks thorough several Vessels; into which nevertheless, as has been said, very few Animal Spirits can be carried, and that through very few and most slender Nerves. Add to this, that the Acid Spirit of the *Glandules* has a coagulating Power, and therefore would be a strange obstruction to the thinness of the Liver. Moreover, *Swalve* himself *Eod. lib. p.* 88. and 89. most eagerly maintains, that nothing, not so much as the thinnest of Liquors can be carried through the Pores of the Nerves, and therefore much less such a quantity of Spirits, out of which a part of such a copious *Lympha* must be made.

Whether Alimentary.

XXVIII. N. Zas *above-cited, writes, That the* Lympha, *which he calls* Dew, *is an Alimentary Juice, by which the Nerves, the Membranes, Tendons, also the Tunicles of the Veins and Arteries, and all the Spermatics are nourish'd, increas'd in growth and enlarg'd.* But among all the foregoing Opinions, there is none that carries with it less probability than this; which is utterly destroy'd by what we have written *L.* 2. *c.* 12. where we prove at large that all the Parts are nourish'd by the Blood, and not by any other Humours. But *Lewis de Bills*, from whence *Zas* draws all his main Fundamentals, finding that *Zas* was too short in the defence of his Argument, has found out another Invention; for he distinguishes between *Dew* and *Lympha*, and says that the *Dew* serves for the Uses by *Zas* assign'd, but not the *Lympha*: He also ascribes different Passages to each of them, by which they flow to their parts; of which passages or ways I have lately treated, and sufficiently demonstrated the vanity of this Invention.

Seeing then that most Learned Men and Studious Assertors of the Commonwealth of Physic, did not discern the true Original of this Lympha, *and hardly seem to have reach'd the use of it, I will not be afraid to venture my own Opinion concerning this Matter.*

What sort of Liquor it is.

XXIX. *I take the* Lympha *to be a fermentaceous Liquor, separated from the serous part of the Blood in the cluster'd Glandules, yet not simple, but mingl'd with much volatile and liquid Salt, and impregnated with some few sulphury Particles, which by reason of the thinness of its Parts enters these Vessels, and is carried through them, partly to the* Vasa Chylifera, *partly to many Veins.* To *THOSE*, that in them it may by its mixture make the *Chylus* thinner and more easie, and more apt to make an easie Dilatation in the Heart. To *THESE*, to the end that being mingl'd with the Venal Blood, not at present so thin, it may prepare it to a quick Dilatation in the Heart: for in both respects the Mixture of it is very necessary. For the *Chylus* of it self is somewhat sweetish, and somewhat fatty, which shews the predominancy of the sulphury Juice, not as yet become

become ſufficiently ſpiritous. And hence, by reaſon of the viſcid and thick Particles, ſeeing that if it came alone to the Heart, it is unapt for Dilatation, there is a neceſſity, that by the way this Liquor ſhould be thin, ſaltiſh, ſowriſh, and endu'd with a kind of fermentaceous Quality, to attenuate its viſcouſneſs, and prepare it for Fermentation. For as Mineral Sulphur, by reaſon of its viſcous Particles, by it ſelf ſlowly, and by degrees, but by the mixture of the Salt-Peter, cutting thoſe Particles, kindles at the very touch of Fire; ſo alſo the ſulphury Particles of the *Chylus*, if other ſaltiſh and thin Particles were not mix'd with it to a juſt proportion, would be ſlowly, and not ſuddenly dilated, and become ſpiritous in the Heart.

XXX. *To which purpoſe aforeſaid the Pancreatic Juice does alſo in ſome meaſure contribute, being mix'd with the* Chylus *in the* Duodenum, *which is a kind of a ſtronger and ſharper* Lympha, *and indu'd with a more vigorous fermentaceous Quality.* And therefore it is that this *Lympha* being carried with the *Chylus* to the Heart, renders it more eaſily diffuſive, and fit to be alter'd into ſpiritous Blood. As in *Gunpowder* the Mineral *Sulphur* mix'd with the *Salt-peter* and *Coals*, preſently takes fire. But the Venal Blood, having loſt a great part of its Spirits in the nouriſhment of the Parts, and the length of its Courſe, has need of ſome mixture of the *Lympha* to facilitate its fuſion in the Heart. But becauſe it is much thinner than the *Chylus*, and ſtill mix'd with many Spirits: Hence it is that it requires the leſs quantity of *Lympha*, and that's the reaſon that fewer *Lymphatic Veſſels* open into the Veins, but a vaſt number into the Milkie Veſſels.

Whether the Serum.

XXXI. *Now becauſe this* Lympha *is ſeparated from the ſerous part of the Blood, the Queſtion is whether it be not the* Serum, *or a Liquor different from it?* To which I anſwer, *That it is not the* Serum, *but a particular thin Liquor, extracted out of the Serous part of the Blood.* For in this *ſerous* Humour, beſides the watery Particles, are contained other *briny* Particles in good quantity, and ſome *ſulphury* Particles. The *ſalt Particles* are apparent from the *briny* taſte of *Tears*, *Sweat*, and *Urine*; the *ſulphury* from hence, that *ſtale Urine* being heated, is eaſily fir'd by the touch of the leaſt flame. Then again in theſe there are other more viſcous, more crude and fix'd Parts, as are often to be diſcern'd in Urine; others more thin and ſpiritous, which by reaſon of their extraordinary thinneſs, together with the thin watery part of the *Serum* in which they abide, being ſeparated from the thicker Particles on the cluſter'd Glandules, eaſily enter thoſe narrow Orifices of the Lymphatic Veſſels, proceeding from thoſe Glandules, (from whence the thicker Particles are excluded by reaſon of their thickneſs) and through theſe are carried to the *Vaſa Chylifera* and ſeveral Veins.

The difference between the Lympha *and the* Serum.

XXXII. *The difference between the* Lympha *and the* Serum, *is hence made plain; for that the* Lympha *being taken out in a ſpoon, not only held to the fire for the thinner Particles to exhale (which is the direction of* Rolfincius) *but being cool'd of it ſelf, without any Exhalation before the fire, thickens into a Gelly; whereas the* Serum *will neither thicken before the fire, nor without fire.* For that the Salt of the *Lympha*, which ſeems to contain in it ſomewhat of *ſowriſh*, being reduc'd to an extraordinary thinneſs in its moſt thin watery Particles, and impregnated with ſome *ſulphury* Particles, while any heat remains in it, is *very fluid*; but being condens'd by the Cold, is not fixed into *hard and ſalt Cryſtals*; but together with the *ſulphury* Parts mix'd with it, by reaſon of their fatty viſcouſneſs, by which the hardneſs of the ſalt Particles is ſoften'd, it congeals into a *Gelly*, which again diſſolves into a moſt thin Liquor by the heat of the fire. Whereas on the contrary, the cruder Particles of the *Serum* condens'd by the Cold, will never diſſolve through the heat of the fire (which is apparent in Urine) but into crude and clammy Strings, and many of 'em retain a *Stony* and *Tartarous* Form, and will never return to their former thinneſs.

XXXIII. *Now out of what parts the* Lympha *proceeds, which is to be ſeparated in the Glandules, and deriv'd into the* Lymphatic Veſſels, *is by many queſtion'd,* Gliſſon *believes it proceeds from the* Nerves; Bartholine *from the* Arteries. *The* firſt *is abſurd: Becauſe the inviſible Pores of the Nerves cannot give paſſage to ſuch a viſible and copious Liquor, without a Palſie of the Parts, and an extream Relaxation of the Nerves with con-*

continual Moisture. The latter *is more probable, by reason of the quantity of the* Lympha, *which cannot be so copiously strain'd out of any Vessels as out of the Arteries, in regard that all the Glandules receive some ends of the Arteries.* And so from that Arterious Blood forc'd into the Glandules, by reason of their *Specific* Structure, the *Lympha* seems to be separated in the same manner almost as the *Serum* is separated from the Blood in the Kidneys: and from the little Arteries of the Choroidal Plexure the lymyid serous Liquor is separated from the same Blood by the Glandules lying between, and deposited in the Cavities of the Ventricles of the Brain, from thence to be evacuated through the *Papillary Processes*, or Extremities of the *Olfactory Nerves*. But in the Liver, which receives very few Arteries, but sends forth many *Lymphatic Vessels*, and pours forth a copious quantity of *Lympha* out of its Glandules, this *Lympha* cannot be there so copiously separated and pour'd forth out of so few Arteries chiefly creeping along the Exterior Membrane, but is rather separated from the Blood brought through the *Vena Porta* (which here performs the office of an Artery) by the Glandules that adhere to the hollow part of it.

The Impulsive Cause.

XXXIV. *But what it is that presses forth the* Lympha *out of the* Glandules *of the Liver, Spleen, and other parts, and thrusts it farther when once enter'd the* Lymphatic Vessels, *is apparent from what has been said concerning the thrusting forward of the* Chylus, *c.* 11. *&* 12. For the impulsive Cause is the same, that is to say the Motion and Pressure, partly of the lower part of the Belly by the Muscles of the *Abdomen* mov'd upward and downward; partly by the Respiration of the *Lungs*. That which proceeds from the Joynts, is mov'd by the motion of the Muscles of those Parts; as we find by the motion of the Jaws and the Tongue a great quantity of Spittle flow into the Mouth, which Spittle is a kind of *Lymphatic Juice*, but somewhat thicker, whereas when a man sits motionless, or lyes asleep, his Spittle is nothing so plentiful. For by the Compressure of these Parts, as well the *Glandules* therein conceal'd, as also the *Lymphatic Vessels*, are press'd, not only by the Muscles, but also by the incumbent flat Bowels, by which means the contain'd Liquor is squeez'd and thrust forward out of those Vessels.

XXXV. Charleton, Oeconom. Animal. *writes that the Motion of the* Lympha *through its Chanels is very slow. But* Bartholine in Spicileg. *confutes that Opinion, and proves the contrary.* For my part, I believe the *Lympha* to be mov'd sometimes *slower*, sometimes *swifter*, according to the more vehement or remiss motion of the Parts where the cluster'd *Glandules* and the *Lymphatic Vessels* lye, as happens in the *Salival Vessels* under the Tongue, which proceed from cluster'd *Glandules*.

The Cause of the Dropsie call'd Ascites.

XXXVI. *Observe by the way concerning the* Lymphatick Vessels *lying hid in the lower Belly, that if they be broken up by any accident, (for they are very tender) then there happens to be a serous Liquor pour'd forth into the hollow of the* Abdomen, *the increase of which at length insensibly produces that sort of Dropsie, call'd* Ascites; *tho' it may also proceed from other Causes.*

1. Observation.

In the Year 1658. we dissected a young Woman of four and twenty years of Age, which for seventeen years had labour'd under that Distemper call'd *Ascites*, and at length dy'd of it. In whom I did not perceive the least defect of her Bowels, only that some of the *Lymphatic Vessels* were broken, which was the Cause of the Distemper; for in her Childhood she had been cruelly us'd by her Parents, who were wont to kick and thump her; and those blows occasion'd the breaking of her *Lymphatic Vessels*. Which Suspicion, the Humours that were gathered together in the *Abdomen*, did not a little confirm. For they appear'd somewhat coagulated in the Body, when it was cold; tho' it was not come to that consistency of a Gelly, as is usually seen in the *Lympha* when taken out of the *Lymphatic Vessels* in a Spoon. However, the reason why she had liv'd so long in Misery, was the soundness of her Bowels, and for that by reason of the youthful heat of her Body, much of the *Serous* Moisture insensibly flowing into the Concavity of the *Abdomen*, was every day consum'd.

2. Observation.

XXXVII. *These Vessels being broken, sometimes also it happens that the Lymphatic Liquor does not come to be pour'd forth into the Cavity of the* Abdomen, *but flows out between the*

neighbouring Membranes, and that occasions the production of those watry Bladders, call'd Hydatides, *with which the Liver sometimes within, sometimes without, and sometimes also the Mesentery, and other parts in the* Abdomen *are seen to abound.* A great number of these Bladders (some as big as a Pigeons Egg, others as a Hen Egg, and many less) *William Straten*, at that time Physic and Anatomy Professor in our Academy, afterwards principal Physician to the *Prince of Orange*, shew'd us in the hollow part of the Liver of a Thief that was hang'd, *Febr.* 1647. We have also shew'd 'em growing sometimes in the Mesentery before the Students in Physic at our Hospital: and there also we have seen Livers, which withoutside have been cover'd with little Bladders full of Lympid Water, of which number, some having been lately broken, had infus'd a *Serous* Liquor into the Cavity of the *Abdomen*, and by that means had occasion'd an *Ascites*. Hence I concluded that the Dropsie, call'd *Ascites*, is never generated without some Solution of the *Continuum* of the inner Parts of the *Abdomen*, whatever the Cause of it may be, and I thought their Opinion to be rejected, that this Disease is begot by the condensation of the Vapours exhaling out of the Internal Parts into Water, when that Exhalation in some Men happens to be continual, and yet very few come to be troubled with the *Ascites*. *Volker Coiter*, *Obser. Chirurg. Musc. p.* 117. writes that he himself found in the Body of a Phthisical and Dropsical Man, the Bowels of the lower Belly wasted, and emptied of all their Moisture; but little Bladders, some bigger, some less, adhering every where to the *Mesentery*, *Peritonæum*, *Intestines*, *Spleen*, *Liver*, and *all the Bowels*, and all those little Bladders full of Water. The same Case is cited by *Cordæus. Com.* 5. *ad Hipp. de Morb. Mul.*

XXXVIII. *Now there may be several Causes for the breaking of these Vessels: But besides violent and external Accidents, the most frequent Cause is, either Corrosion by sharp Humours, or else their Obstruction and Compression.* And for this Reason the *Ascites* happens to Gluttons and great Drinkers, that every day stuff and swill their Guts, who from the Crudities hence bred, either heap together a great quantity of sharp Humours in the Body, or else bring a weakness and obstructions upon the Bowels, by which means these little Vessels are either corroded, or else compress'd and straiten'd, that they cannot carry and discharge their *Lymphatic* Humour as they were wont to do, which therefore flowing out of the *Lymphatic Vessels*, either causes little Membranes among the Bladders; or else the covering Membranes being broken, it slides into the Concavity of the *Abdomen*.

CHAP. XIV.

Of the Liver.

I. THE Liver ἡπαρ, *or* Jecur, *is a remarkable Bowel seated in the right Hypochondrion under the* Diaphragma *or Midriff, of a vast bigness, round and smooth in the convex or gibbous part, but concave in the lower part, where it rests upon the right side of the Stomach.*

Lobes. II. *In Dogs and many other Beasts it is divided into several* Lobes, *but in Man it is contiguous, swelling into a little* Lobe *in the lower sinous, saddle or flat part.* It is rarely divided into three Lobes, which *James Sylvius* in *Isagoge*, reports to have seen.

Bigness. III. *The bigness of the* Liver *is not the same in all Creatures, but according to the proportion of Bodies, it is larger in Man than in other Creatures, and the natural and ordinary bigness is such, that it descends three or four fingers below the Bastard Ribs, and extends it self somewhat beyond the pointed Cartilage of the Breast. Andrew Laurentius* writes, that in cowardly People, great Drinkers and Gluttons, the Liver is thought to be bigger. Which Rule however, 'tis very probable, is lyable to many Exceptions. In a preternatural Constitution it deviates from its ordinary Magnitude, as well in excess as defect. In the Year 1660. I dissected a Body wherein the Liver was of that enormous Magnitude, that it caus'd Admiration in all the Spectators; for below it reached down to the Groyns, and extended it self from the right side to the Spleen, and so possessed the chiefest part of the whole lower Belly. But tho' to the outward view and touch, it seem'd

to

to be of a healthy Colour and sound Substance, yet we found in the middle of it a large hollowness, from whence to the amazement of all the Beholders, we took out eleven Market pounds of Matter, white, well-concocted, and without any ill smell. Other monstrous large Livers are describ'd by *Spigelius Anat. l.* 8. *c.* 12. *Riolanus Anthrop. l.* 2. *c.* 21. *Bartholine Obs. cent.* 1. *hist.* 85. and by several others.

IV. *Less frequently is the Liver defective for want of its due proportion.* And yet we find an Example of that too in *Riolanus*, *lib. citat.* who writes that at *Paris*, in a certain Body, was found a Liver that was no bigger than a *Kidney*; and thence he observes out of *Avicen*, that the smalness of the Liver is always noxious, but not the bigness.

How you may guess at the largeness of the Liver by the bigness of the fingers, See *l.* 4. *c.* 1.

Substance. V. *The Substance of it is soft and ruddy, like congeal'd Blood, the firmness of which appears nevertheless when the Liver is boyl'd.* There lye hid in it many Kernels, out of which the *Lymphatic Vessels* break forth.

VI. Malpigius, *who has examin'd the substance and inner parts of the Liver, most accurately by his Microscopes*, l. de hep. c. 2. *has observ'd many things unheard of, and hitherto altogether undiscover'd.* 1. *That the substance of the Liver in a Man consists of little Lobes, which shew forth a heap of Clusters, and are cloath'd with their own enfolding Membrane, and strengthen'd by membranous Knots continued athwart, so that there may be observ'd middle spaces, and little small chinks, between the sides of the Lobes.* 2. *That the whole Mass of the Liver consists of glandulous Balls and several Roots of Vessels; and hence, that they may all cooperate for the common good, there is a necessity of an intercourse between the Vessels and these Glandules.* 3. *That the Branches of the Vessels of the* Porta, Vena Cava, *and* Porus Biliarius *in an equal number through all the small Lobes, and that the Roots of the* Vena Portæ *supply'd the place of Arteries, and that there is such a Correspondence between the* Porta *and the* Porus Biliarius, *that both their little Branches are closely contain'd under the same Covering.* 4. *That the Roots of the said Vessels are not joyn'd together by way of* Anastomosis, *but that the glandulous Balls, constituting the chief substance of the Liver, are in the middle between the Vessels that bring and carry, by means whereof those that carry infuse their liquor into those that bring.* From which Observations he concludes that the Liver is a conglomerated or cluster'd glandule separating the Choler, and this (*Ibid. cap.* 3.) he endeavours to prove by several Reasons. And because this is proper to conglomerated Glandules, that besides the Arteries, Veins, and Nerves, they enjoy their own proper emptying Vessel (as is apparent in the *Parotides*, Sweetbread, and others) which is dispers'd through their Substance, and extracting and carrying off the design'd Humour; he asserts this Vessel in the Liver to be the *Porus Biliarius* with the *Gall Bag.* Most certainly these new Observations of the famous *Malpigius* dispel many Hepatic Obscurities, and lighten us to the inmost knowledge of the Liver. For formerly there was no question made, but Choler was generated in the Liver; but how it came to be separated from the Blood, was not known: but now by the Observations of this quick-sighted Artist, it appears to be done by the small Kernels and glandulous Balls lying up and down *.

As to the truth of this Hypothesis, see our Synopsis Medicinæ, lib. 4. cap. 8. Sect. 10. §. 14. ad 36. *where we have, by indubitable Reason, strong Arguments, and matter of Fact, prov'd that there is no Choler or Bile separated from the Blood in the Liver.* Salmon.

Whether the Liver may be call'd a Bowel. VII. *But tho'* Malpigius, *by reason of these new Golden Inventions seems unwilling to call the Liver a Bowel for the future, but rather a conglomerated or cluster'd Glandule; yet I beseech him to grant us this liberty, that we may still, for a while, call it a Bowel, lest by too sudden a change of the name, we should render our Discourse obscure, especially among those who never heard of this Denomination before.*

VIII. *In the mean time the Condition of the unfortunate Liver is to be lamented; as being that which formerly was call'd the Principal Bowel, and by* Galen *seated in the highest*

Throne of Sanguification, and there has been worshipp'd for many Ages by the common consent of Physic; yet that in these our times it should be torn and depos'd from its Throne, and despoil'd of all its Soveraignty; nay that it should be said to be dead, and therefore be buried, and only remembred with an Ironical Epitaph by *Bartholine*, and yet contrary to the expectation of all men, like a *Silkworm* chang'd into a *Butterflie*, so metamorphos'd into a pitiful *conglomerated Glandule*, be beholding to a miserable resurrection in that likeness.

Colour of the Liver. IX. *The Colour of the Liver obvious to sight, which is ruddy, is not peculiar to it, by reason of its frame, and composition, but accidental, by reason of the copious quantity of Blood infus'd into it, through the* Vena Portæ, *as by the following Experiment of* Glissons *may appear.* The proper Colour of it is pale, slightly inclining to yellow, which however it seems to be a tincture which it receives from the Choler passing through it: and hence it is that *Malpigius* ascribes to it a white Colour.

The Temperament. X. *By reason of the vast quantity of Blood that flows to it, the temperament of it is hot and moist, and by its heat it cherishes and comforts the Stomach.*

Its Membrane. XI. *It is incompass'd with a thin Membrane, arising from the* Peritonæum *that girds the* Diaphragma, *and rolls it self back about the Liver.*

The Ligaments. XII. *It hangs as it were strictly fasten'd above through all its Circumference to the* Diaphragma, *with a broad membranous strong Ligament, arising from the* Peritonæum, *where it adheres to the joynted Cartilage.* Erroneously therefore wrote *Spigelius*, that it is distant a fingers breadth from the *Diaphragma*. This Ligament is not only fasten'd to the outermost Membrane of the Liver, but constitutes it, and to the end it may sustain the weight of so large a Bowel without the hazard of breaking, it descends toward the inner parts of it, and is fasten'd to the common sheath or swath of the Branch of the *Vena Portæ*, where the *Navel Vein* adjoyns to it. To this broad Ligament is joyn'd another peculiar round and strong Ligament springing also from the *Peritonæum*, where the Liver is joyn'd upon the right and left side to the *Diaphragma*. But this Ligament we have seen more than once wanting in Men; and for the most part is not to be found in Beasts; and there some Dissecters of Beasts, that have not seen many Dissections of Human Bodies, from their Dissection of Brutes, believ'd that Ligament to be frequently wanting in Men. Below, it is fasten'd to the *Abdomen* by the Navel Ligament, that is, the Navel Vein cut off after the Birth, and chang'd into a Ligament, by which the massie Bowel is kept fast in its place, and hinder'd from ascending higher with the *Diaphragma*.

XIII. *It also adheres to other neighbouring Parts, as the* Vena Cava *and* Vena Portæ, *the* Omentum, &c. *Which Ligaments however do not hold it in its hanging Posture.*

XIV. *By these Ligaments, altho' the Liver be fix'd in its place, yet is it not so straightly ty'd, but that it may be mov'd with Convenience enough in Respiration upwards and downwards, and in the Motion of the Body to the Right or* Left, *or in any other Posture, as Necessity requires.*

Its Nerves. XV. *It admits into it four very small Nerves; two from the sixth Pair; a third from the Stomach Pair, and a fourth from the Costal Pair; to which the obtuse Sense or Feeling of that Membrane or Tunicle only that involves it is attributed; for they do not seem to penetrate into the inner Substance of it.* However *Galen* 4. *de us. part. c.* 23. & 3. *de loc. affect. c.* 3. & 4. has observ'd two notable Nerves which accompany the *Vena Portæ* enter the *Parenchyma*. It wanted not bigger nor more inward Nerves, as that which needed not to feel, and making the Ferment it self, might well be without the fermentative Quality of the Animal Spirits.

Its Arteries. XVI. *It is furnished with very small Arteries coming to it from the right* Cœliac *Branch (according to* Veslingius *very few, but according to* Walæus *innumerable) and* Dominic. de Marchettis anat. c. 4. *writes that he has sometimes seen when the upper* Mesenteric Artery *has communicated a large Branch to the*

the Liver. These Arteries *Galen* tells us are chiefly dispersed through the Hollow or Saddle Part of it. *Rolfinch* says that he has observ'd 'em very numerous in the Convex Part of it. *Glisson* observes no little Branches of small Arteries extended toward the inner Parts of the Liver, but all plainly to terminate in the Membrane. Reason altogether confirms *Glissons* Opinion; for the Substance of the Liver has hardly any need of *Arteries*, seeing that the Blood flows to it in Quantity sufficient enough through the *Porta* Vein (which here performs the Office of an *Arterie*) which Blood by reason of its similitude in Substance, is more convenient for its own Nourishment and making of choleric Ferment, than the *Arterous* Blood. Nor does the *Vena Portæ* with its Branches, nor the Roots of the *Vena Cava* want *Arteries*; as being sufficiently furnished and nourished with their own contain'd Blood; nor does it ever appear, that any little Branches of *Arteries* are inserted into the Tunicles of any Veins for their Nourishment. Therefore because fewer Parts of the Liver are nourished with *arterial* Blood, *Veslingus* seems not erroneously to have observ'd, that only a few *Arteries* enter the Liver. Hence *Lindan* takes notice, and that very truly, that those *Arteries* seem rather to stop in the investing Membrane, than to penetrate into the Substance of the Liver.

The Veins. XVII. *It has double Veins. For in the upper Part, the* Vena Cava *seems to be joyn'd to it, into which many Roots being up and down dispersed through the Substance of the Liver, discharge their Blood.* With these Roots, in the lower Part, meet the little Branches of the *Vena Portæ*, which run likewise through the whole *Parenchyma*.

The Choler Vessels. XVIII. *To these Vessels is adjoyned the* Porus Biliarius, *which is dispersed through the Liver with innumerable Roots, receiving the Choler separated from the bloody Ferment:* With which moreover are intermingl'd other very thin Roots afterwards closing together, and in one little Pipe conveighing the Choler to the Vesicle of the Gall.

The Lymphatic *Vessels.* XIX. *Besides these Vessels,* Asellius *writes, that he has observ'd a Branch of the milkie Vessels in the* Liver. *But without doubt the Egress of the* lymphatic *Vessels, at that time altogether unknown, from the* Liver, *deceived him.* For there are no milkie or *chyliferous* Vessels that run to the Liver, as we have a thousand times demonstrated in our Dissections of Brutes as well alive as dead; but many milkie Vessels issue forth out of it, carrying a most clear and transparent Juice.

So also Gualter Charleton l. de Oecon. Animal. *saith, that the same is to him unquestionable by a thousand Experiments, and therefore he concluded without any farther Scruple that there was no Portion of the* Chylus *conveighed to the* Liver. And therefore no Credit is to be given to *Gassendus* and *Backius*, who believe the *Chylus* to be carried to the Liver through the *Ductus Cholidochus*. For the obstructing Valves, and the narrow and oblique Entrance of the *Ductus* into the *Duodenum*, and the contrary Motion of the Choleric, and Pancreatic or Sweetbread Juice toward the Intestine, in living Animals obvious to the Sight, sufficiently refute their Opinion.

The Intermixture of the Vessels. XX. *The Vessels of the* Liver *are intermix'd after a wonderful manner through its Substance or little* Lobes, *as plainly appears if the Flesh be separated, which is to be done leisurely and carefully, for fear of tearing the Vessels. For the performing of which Excarnation,* Glisson *describes three ways.* Anat. hep. c. 21. Formerly it was asserted by the *Anatomists*, that the Roots of the *Vena Cava* ran chiefly through the upper Part, but that the little Branches of the *Vena Portæ* ran chiefly through the lower part of the Liver. But by the more indefatigable Industry of *Glisson* and *Malpigius*, it is since discovered, that both the aforesaid Vessels, and the small Branches of the Gall-Vessels, are equally dispers'd and intermix'd one with another through the whole *Parenchyma*, and reach to every Part alike: But that the little Branches of the Gall-Vessels are much less than those of the *Vena Cava* or *Portæ*: For that through those the fewer and thinner Choleric Humours glide; through these the more bloody and somewhat thicker are to be conveighed. And it was but Reason that these Vessels should be dispersed through the whole Bowel, when all its Parts conspire to the same Performances. However the Liver is harder in its lower Part,

Part, by reason of the Ingress and Egress of the larger Vessels, as also for that the Conglobated *Glandules* are there chiefly seated.

XXI. *But how all these little Branches are intermingl'd one among another in the* Liver, *there is a great Dispute among the Anatomists.* For I say nothing o the *Lymphatic* Vessels, for that they take their Rise no farther than from the *Conglobated Glandules*, nor enter any farther into the rest of the Substance of the Liver. The greatest part of Anatomists, following *Galen*, write that the little Branches of the *Porta* with the Roots of the *Vena Cava*, are joyned together by many *Anastomoses*, so that sometimes they close together at their Ends, sometimes their Ends enter into the Sides of other little Branches; and that to these the interjected Bilarie Vessels are fasten'd by frequent *Anastomoses*. To these *Fallopius*, *Carteſius*, *Riolanus*, and several others are of a contrary Judgment, who altogether question those *Anastomoses*, and affirm that either they are not at all, or else very obscure. *Bartholine* writes, from the Observation of *Harvey*, that the Roots of the *Vena Portæ* creeping through the Gibbous Part of the Liver, are covered with Sieve-like Tunicles full of infinite Pinholes, otherwise than the Branches of the *Vena Cava*, which are divided into large Arms, and that the various Excursions of each Vessel run forth into the Bossie Part of the Bowel without any *Anastomoses*. *Bauhinus* tells us of a remarkable *Anastomoses*, which represents a Channel, and is as it were a common and continued Passage from the Branches of the *Vena Portæ* into the Roots of the *Vena Cava*, admitting the point of a good bigg Bodkin. Into this apparent Channel others deny that any Branches of the *Vena Porta* are opened, because that no such Opening could either be seen or observ'd. *Glisson* writes that this Chanel is a Production or Continuation of the *Umbilical* Vein through which, in the *Embryo*, the Navel-Blood is carried directly to the *Vena Cava*: But that it is altogether shut up in Men that are once Born, and together with the *Umbilical* Vein supplys the Office of a Ligament, neither do any Orifices of any other Vessels open into it.

XXII. *So that how the Blood flows out of the little Branches of the* Vena Portæ *into the Roots of the* Vena Cava, *and* Vena Portæ, *from the foresaid various and differing Opinions can hardly be made manifest.*

XXIII. *In this Obscurity not only* Malpigius *by his Observations made with his Microscope, but* Glisson, *an exact Examiner of the Liver, affords us great Light.* Which latter, by his frequent Excarnations of this Bowel, writes that he has found by Experience, that the Branches of the *Vena Portæ* and *Vena Cava*, joyn one to another, and there grow close together, but do not open into one another, nor that any little Branches are inserted into the Side of one another, or close with the Ends of any other, but only that the Sanguineous Humors are emptyed through the Ends of the Branches of the *Vena Portæ* into the Substance of the Liver, and from thence again enters the gaping Ends of the *Vena Cava*, and Gall Vessels, all which Ends terminate into the Substance of the Liver; (this *Malpigius*, as aboveſaid, observed to be perform'd or done by the means of the *Glandulous* Balls, of which the Substance of the Liver chiefly consists) and that there is as much Blood and Humors suck'd up through the gaping Ends of those Roots, as is poured into the Substance of the Branches of the *Porta*, always granting a due and just proportion of the Bowel.

The Passage of the Blood out of the Porta *into the* Cava.

Certainly I believe there is great Credit to be given to the Experience of this famous Person. For his Treatise sufficiently testifies that he was very diligent and laborious in making his Scrutinies into the Liver; and therefore we have thought it necessary to quote his Experiment, by which he solidly proves that there are no *Anastomoses* of the Vessels in the Liver, *anat. Hep. c.* 33. in these Words.

XXIV. *For the farther Confirmation,* saith he, *of this Opinion, I will bring one memorable Experiment, which gives a great Light not only to this Passage of the Blood out of the* Vena Portæ *into the* Cava, *but to several other things belonging to the Circulation of the Blood.*

Glisson's *memorable Experiment.*

At a Dissection therefore at London, *we thought fit to try, how easily Water being forc'd into the* Porta *would pass through the Liver. To that end we took a good large Ox's Bladder, fitted to a Pipe (as when we give a Glister) and fill'd it with warm Water coloured with a little Milk, and then having ty'd it with a String that none of the Liquor might slide back,*

back, we put in the top of the Pipe into the Porta *near the Liver. Presently the Bladder being hard squeez'd, the Water passing through the Pipe, enters the* Vena Cava, *and thence carried into the right Sinus of the Heart, goes to the Lungs through the* Arterious *Vein, and passing through them slides down into the left Ventricle, thence is carried into the* Aorta; *and lastly we discern clear Milkie Footsteps of this Humor in the Kidneys. The Liquor thus transmitted into the Liver, wash'd away the Blood by degrees, not only from the larger Vessels, but also from the* Capillaries *and the* Parenchyma *it self. For the bloody Colour seem'd to vanish by degrees, and by and by all the Blood being wash'd away, the Liver turn'd from a white and dark Brown into a kind of Yellow. Which Colour, as seems most probable to me, is neareſt the natural Colour of the Liver, than the Ruddie which it borrows from the Blood continually passing through it. After this Experiment made, we cut pretty deep into the* Parenchyma *it self, that we might know whether the inner Parts of it were likewise chang'd, and there we also found all the Blood so washed away likewise, that it could hardly be done in such a manner any other way: For that the whole* Parenchyma *was all of the same Colour before mentioned. Now if the injected Liquor had penetrated the Liver by the help of the* Anastomoses, *how came it to pass that all the Blood was thence wash'd away, and that the* Parenchyma *having lost the bloody Colour, should presently of its own Accord put on the new Colour. Certainly the Water could add no Colour to it, which it wants it self. Nor could the Milk impart to it that dark Brown Colour, altho' by that means it might retain something of its Whiteness. But for the avoyding of all farther Dispute, I often try'd this Experiment with Water alone. Yet still the Colour appear'd to be pale and dark Brown; and because it appear'd to be alike in all the parts of the* Parenchyma, *it was a certain sign, that the Water wash'd all the Parts alike. Which could not any way have been done, if part of it, having made its Passage through the* Anastomoses *had slid immediately into the* Vena Cava. *Now that the Blood naturally takes the same Road with the Water, I do not believe there is any one that questions. And therefore I think it fit thereupon to conclude that the Blood does not glide through those feign'd* Anastomoses, *but runs thorough the* Parenchyma *of the Liver it self.*

XXV. *This celebrated Experiment, added to the celebrated Observations of* Malpigius, *so clearly illustrates the Understanding of a thing hitherto so obscure, that now there can be no farther Doubt concerning the manner of the Passage of the Blood out of the* Porta *into the* Vena Cava, *nor of the natural Colour of the Liver it self, which being boyl'd, appears to be of a pale yellowish Colour, inclining to a dark Brown.* And hence moreover it is most clearly apparent, how in other Parts also, the Circulation of the Blood is made not only through the *Anastomoses* of the *Arteries* with the Veins, but through the Pores of the Substance of the Parts themselves. Of which more at large *l.* 2. *c.* 8.

XXVI. *As the Trunk of the* Porta *Vein entring the Liver in the hollow Part, sends forth a thousand Branches into it, so likewise a thousand Roots of the* Vena Cava *are dispersed through those interjacent Ramifications, and there by little and little meet together toward the uppermost and inner part of the Liver, and become fewer and larger, till at length they close into one Trunk, Continuous to the* Vena Cava: *Which, according to* Riolanus, *is fortified with a Valve preventing the Ingress of the Blood out of the* Vena Cava *into the Liver.* Concerning which see *l.* 7. *c.* 10. But before they close together into that Trunk, certain membranous Circles on the inner Side, like Valves, are opposed to the Boughs of the larger Roots meeting together, sometimes thicker, sometimes thinner, which *Bartholine* has observ'd looking toward the greater Tunicle. These hinder the Return of the Blood going forward toward the *Vena Cava.*

XXVII. *Concerning the Office of the Liver there are various Opinions, of which the Ancienteſt and the most received is from* Galen, *who saith that Sanguification is compleated in the Liver, and that it is the true and primary sanguifying or blood-making Bowel.* *The Office of the Liver.*

But this Opinion, after the Discovery of the Circulation of the Blood, has been wholly abolish'd; since it is found that the Blood is only made in the Heart.

Which

Which *Hippocrates* himself clearly signifies *L.4. de Morb.* where he says, *The Heart is the Fountain of Blood; the seat of Choler is in the Liver.* Moreover, Reason contradicts that Opinion: *First*, Because there are no *Milkie Vessels* that reach to the Liver, and consequently nothing of the *Chylus* is carried thither to be chang'd into blood; for that the *Chylus* neither ascends nor passes through the *Mesaraic Veins*, we shall farther shew *L.7. c.22. Secondly*, Because in the *Embryo* the Heart and the Blood are seen before any Rudiments of the Liver are seen: whereas the Liver, if it were the Efficient of Sanguification, of Necessity, it ought to precede its Effect, that is to say, the Blood. *Thirdly*, Because when all the Bowels are form'd, and that in the beginning of the Formation all the Vessels are fill'd with Blood, then is the Liver still of a whitish colour, and inclining somewhat to yellow; which is a sign it does not generate the ruddy blood, seeing that of necessity it ought to be colour'd from the beginning by the blood which it generates and contains, before all the other Parts. But in the beginning it is of a pale colour, afterwards somewhat yellowish, which afterwards it preserves in its Substance, tho' clouded by the copious mixture of the blood.

XXVIII. Bartholine *at first was of opinion that the more refin'd and concocted part of the* Chylus *was carried through the Milkie Vessels, and that out of the* Chylus *the cruder blood is generated, which is afterwards to be brought to perfection in the Heart.* And *Deusingius*, a stiff Defender of this Opinion, believes the *Chylus* comes to the Liver through the Mesaraic Veins, *Tract. de Sanguific.* Nay, that some of the Milkie Vessels reach from the Sweetbread to the Liver, and enter the hollow parts of it: of the former of which Opinions was *Regius.* But afterwards *Bartholine* renounc'd this Opinion, and that with good reason, because it could be no way defended. 1. Because no *Milkie Vessels* reach the Liver. 2. No *Chylus* passes through the *Mesaraics.* 3. Because if the Heart should make blood of the crude blood made in the Liver, and not of the *Chylus* it self, of necessity all the *Milkie Vessels* must run to the Liver, and carry thither all their *Chyle*, to be turn'd into blood, and none would run to the *Subclavial Veins*, and a good part of the *Chylus* would ascend through the *Mesaraics* to the Liver. But our Eye-sight convinces us of the truth of the first, and Reason of the latter. See *l.7. c.2.*

Whether it be a Streiner.

XXIX. Glisson *believes the Parenchyma of the Liver to be a certain Streiner through which the Blood and Humours pass, and that those alterations which they undergo in the Liver, are accomplish'd by percolation.* True it is, such a simple streining may separate the thin from the thick, but occasion no other alteration worth speaking of. Besides, where there is any streining, there the thin pass thorough, and the thick remain behind. But through the Liver not only all the Blood passes, neither is there any thing of thick that remains behind; but also some part of the ruddy Blood passing thorough, losing its own nature and sweetness, is chang'd into bitter and yellow Choler. If *Glisson* should perchance object, That that same Choler is the thicker part, and therefore it does not pass with the rest of the blood, but is evacuated thorough the *Ductus Biliarius*; I answer, That the Choler indeed does often acquire a certain thickness in the Gall-bag, through its long standing, and the dissipation of the most thin parts by the heat; but that the said Choler, so long as it remains in the Liver mix'd with the blood, is thinner than the blood it self. And this I will prove by the Roots of the *Porus Biliarius*, and the Gall-bladder, which are much less, much thinner and narrower, than the Roots of the *Vena Cava* inserted into the Liver. For if it were thicker, it could never be suck'd in, and evacuated through Vessels much thinner than the rest; and leave the thicker to be receiv'd by the bigger and larger Roots of the hollow Vein. Besides, the Choler sweats through the Tunicles of the Gall-bladder, and dyes the neighbouring Bowels of a yellow colour; whereas the blood never sweats through any Tunicles of the Veins, which are thinner and softer than that Bag; and this is very likely to be true, because it is much thicker.

The true office.

XXX. *Therefore the true office of the Liver is to moisten the Blood with a sulphury Dew, and together with the Spleen to perfect the Ferment of that and the* Chylus. And therefore all Men, all Creatures, as well by Land as by Water, are furnish'd with the Liver, because without that Ferment the spiritous blood could never be made.

XXXI. *From all that has been said, it*

it appears, that the Liver was always reckon'd among the principal parts, when Galen *ascrib'd to it the office of Blood-making; and though in our Age it be depos'd from that Employment, and reckon'd among the Ministerial Parts; yet is it to be rank'd among the Noble Parts, the Use of which we cannot be without, and which officiates in one of the highest Offices, and whose Diseases are most dangerous, and destructive to the health of the whole Body.* Especially the Wounds that are given it, are by *Hippocrates* and *Celsus* numbred among the deadly and incurable, by reason the copious efflux of Blood kills the Patient before it can be stanch'd by any Medicaments; or if the Blood happen to be stop'd, yet the Ulcer that follows the Wound is very rarely or never to be cur'd; so that of three thousand wounded in that part, hardly one escapes. Yet I remember five Cures of that Bowel, which are reckon'd however next to Miracles.

The first is related by *Gemma l.* 1. *Cosmocrit. c.* 6. of a Spaniard cur'd of a Wound in his Liver.

The second Bertin says he saw *L.* 13. *c.* 7. of a Noble Man, whose Liver was not only wounded, but some part of the Liver carried away by the wound, and yet cur'd contrary to all expectation.

The third of a Patient cur'd by *Cabrolius* himself; which Patient had a wound that reach'd the deepest part of the Liver, *Observat.* 18.

The fourth related by the same *Cabrolius* out of *Rochus* of *Tarragon.*

The fifth mentioned by *Hildan*, *Cent.* 2. *Observ.* 34. of a certain *Helvetian*, who after a piece of his wounded Liver was taken out, and terrible symptoms of approaching death, yet recover'd.

None wounded in the Liver escape.

XXXII. *But these are Miracles of Nature which* Averrhoes *formerly asserted to happen sometimes in Cures. For my part I have seen several Wounds of the Liver, as well in the Field as in other Places, but never yet saw any man so wounded escape.*

Worms and Stones in the Liver.

XXXIII. *Things unusual are seldom found in the Liver, yet we find in some Writers the Relations of Stones and Worms that have been seen therein.* Among the rest *Hieronymus Montuus* reports that he has seen a Liver full of Worms *: and such kind of Worms *Wierus* and *Bauhinus* have observ'd. *Borellus* found a Hairy worm in the Liver of a Dog.

* *I once saw the Liver of a great Drinker of Canary, which when it was cut in two with the Knife, abounded with many thousands of Worms; and above a quart of small living Worms were taken from it: this man usually drank two, three, or four quarts of Canary in a day, and that for some years together, by reason whereof he grew fat, and dyed suddenly without any premonitory Sickness: indeed the whole Substance of the Liver was nothing but Worms.* Salmon.

Then for Stones, the Experience of several convinces us that they have been found in the Liver: but they are rarely generated in the Liver; yet the Author of the *German Physical Ephemerides* cites one Example out of *George Greiselius*, of a certain Lady in the lower part of the Lobe of whose Liver there grew a Bladder a hands breadth in length, wherein was contained a shining black glutinous Humour, and in the middle of it a Stone as big as a Hens Egg, shining also, as if it had been full of Niter, but insipid and without any smell, weighing *an ounce and eighteen grains.* The same Author cites another Example out of *James* of *Negropont*, of a Liver of an unusual bigness, weighing above twelve pounds, which was hard, yellow, and here and there strew'd with hard Stones; and in the Gall-bladder, besides much yellow small sand, were contain'd two round, yellow, rough Stones, about the bigness of a Musket-bullet: besides which, another lesser Stone stopp'd up the *Meatus Hepaticus* to the Gall bladder. But tho' Stones are rarely found in the Livers of Men, yet in the Livers of diseased Oxen and Sheep, we have sometimes found 'em very numerous, some red, some yellowish, others white like Tartar of Wine.

The Liver sometimes joyned with the Lungs.

XXXIV. *To this Story of the Liver may be added a certain Conjunction of the Liver with the Lungs, and a wonderful situation of both of them, and the parts adjoyning, which* D. Wassenaer, *a famous Physician at* Utrecht, *imparted to me in writing, as seen by him in a little Child of* Cornelius de Mirop, *Governour of* Wingenlangenraeck. This Child was in his life time Asthmatic, and vexed with a frequent and terrible Cough, upon every slight occasion; and at length dy'd of a Fever at seven years of Age. Whose Body being open'd the 2d of *Febr.* 1665. in the presence of D. *Goyer*, the said *Wassenaer*, and two or three *Chirurgions* and others.

A History. XXXV. *The* Abdomen *being laid open,* saith he, *and the Breast, there was no* Diaphragma *to be found by which the* Thorax *is separated from the lower Belly. Nor was there any more than one Lobe of the Lungs, which being continued on the right side with the Liver, seem'd to be like it both in colour and substance. There was no sponginess in that Lobe, which crossing the middle of the Liver, under the hollow part of it, stuck out like an Appendix. Out of the midst of the Liver certain Passages, like the Gristles of the Windpipe, deriv'd themselves into the* Aspera Arteria *it self. There was no skin or cover that appear'd about the Ribs; for the Liver and right part of its Lobe, stuck every where so close to the Ribs, that they could not be separated but by a Penknife. The* Pericardium, *in which there was but very little Liquor, enfolded but half the Heart, which about the bottom, together with the left and upper part of the Lobe of the Lungs, was so firmly united to the Spine of the Back, as the Liver and right side of the lobe of the Lungs was fasten'd to the Ribs. In the Convex and lower part of the Liver, about the ninth Rib was an Ulcer, full of well concocted Matter. The Stomach also, considering the proportion of the Body, and the Age of the Child, was twice as big as it ought to have been.*

XXXVI. *And thus sometimes we meet with wonderful things, as to the situation, structure, and connexion of the Bowels.*

Another Rarity, where no Liver or Spleen could be found.

As for Example; No less rare and monstrous is that, which upon his own, and the testimony of several other Physicians and Chirurgions, *Schenkius* affirms, *Observ. l.* 3. *viz.* that in the Year 1564. in the dissection of the dead Body of *Ortelius*, a Merchant of *Antwerp*, *there was not so much as the footstep to be seen of any Liver or Spleen*; but that the substance of all the Intestines was fleshie, and much more solid than the flesh of the Muscles, that it seem'd to resemble the flesh of the Heart. That the *Vena Cava* had taken its rise from the Original it self, which was thought to be the Cause that the Patient in his life time was so frequently tormented with an Inflammation and Apostеme in his Lungs. *Malpigius* therefore conjectures, and that not without reason, that the *glandulous* substance of the *Liver*, contrary to the order of Nature, was extended all the length of the Intestines.

CHAP. XV.

Of the Choler Vessels, and the Choler it self.

I. *FOR the discharge of the Choler there are two Passages appointed in the right and hollow part of the Liver, that is to say, the Gall-bladder, and the* Porus Bilarius. Thorough the latter the more feculent and milder Choler flows into the Intestines. Into the former the thinner Choler * flows, and staying there a while, by that stay cuts off the proper quality of the part, but more from the remaining Liquor that sticks to it, acquires a sharper and more fermentative quality.

Two passages in the right and hollow part of the Liver.

* *Rather a kind of Lymphatic Juice, for in the place above-cited of* Synopsis Medicinæ, *it is there demonstratively proved, that there is no such thing in Nature, as the separation of Gall from the Blood; but a kind of Lymphatic Juice, which by the* Fermentum *of the Gall-bladder is changed into Gall.* Salmon.

II. *The Gall-bladder is an oblong Bladder, fashion'd like a Pear, somewhat round, hollow, and seated in the caveous or hollow part of the Liver.*

The Gall-bladder.

III. *At the uppermost and middle part it is joyn'd to the hollow of the Liver; the rest of it hangs forth without the body of the* Liver; *where touching the right side of the Ventricle, and the Gut* Colon, *it frequently moistens and stains both with the Choler transpiring through its Tunicles.*

Situation.

IV. *It is furnish'd with a double Membrane. The one exterior without Fibres, rising from the* Peritonæum, *which invests the pendulous part without the* Liver, *and fastens it to the* Liver, *and is the same with the exterior Membrane of the* Liver. *The other proper and more thick, strengthned with a slippery Slime against the Acrimony of the contain'd Humour.*

Membranes.

This

This several Anatomists, with *Laurentius*, affirm to be interwoven with all manner of *Fibres*, and that with the right Fibres it attracts the Choler to it, with the oblique, it retains the Choler in it, and with the Transverse expells it. Yet to others these *Fibres* seem to be imaginary, in regard they cannot by any way be demonstrated; and therefore *Fallopius* and *Riolanus* explode 'em; and *Glisson* both rejects and refutes their Use describ'd by *Laurentius*. But *Laurentius*'s Cause may be well enough maintain'd, if we say that although these *Fibres* cannot be manifestly demonstrated, yet they may be discern'd by Reason, seeing this part stands no less in need of *Fibres* to maintain and strengthen it, than the *Veins*, *Arteries*, the *Piss-bladder*, and several others, which when they are dilated, contract again by means of their *Fibres*, and so return again to their former Condition. Which distention happens in the *Gall-bladder* by reason of the redundancy of the Gall, or else its Effervescency; which, a Contraction by means of *Fibres*, tho' invisible or obscure, must be of necessity, not only to press forth the Choler out of the Bladder, (which *Glisson* grants) but also to reduce the Gall-bladder to its first condition. To this we may add, that *Fibres* are admitted by *Anatomists* in Veins, which nevertheless no man can easily demonstrate, though it be manifest from their crooked swellings that they have Fibres.

Its Fibres.

Two sorts of Vessels.

V. ***It has two sorts of Vessels, some that open into the Cavity of it; of which more anon. Others, which run thorough its Tunicles or Membranes, which are fourfold.***

1. *Small little Arteries*, proceeding from the upper right Branch of the *Cœliac*. 2. *Many Capillary Veins*, bringing back the remainder of the blood after Nourishment supply'd, and at length closing in two small Branches, through which it pours forth this blood into the *Vena Portæ*. 3. *A little Nerve* hardly conspicuous, deduc'd from the branch of the sixth Pair creeping through the Tunicle of the Liver. 4. *Some few Lymphatic Vessels* propagated from the Liver, running through its exterior parts. The *Arteries* and a *Nerve* enter it about the Neck of it. The *Veins* go forth the same way toward the *Porta*. The *Lymphatic Vessels* in Men enter the same way, and running thorough the bottom of the Gall-bladder, at the lower part are joyned with the rest of the *Lymphatics* proceeding from the Liver. But in those Creatures where the Gall-bladder hangs forth out of the Liver, they enter at the Neck, and fetching a Circuit about the bottom, return the same way toward other *Lymphatic Vessels* proceeding out of the Liver.

VI. ***This Bladder is divided into bottom and neck.*** *The division.*

VII. ***The bottom is larger, round, or shap'd like a Pear, dangling below, of the colour of the Gall contain'd in it; sometimes yellow, sometimes rust-colour'd, sometimes black, and sometimes of a Garlick green.*** *The bottom.*

VIII. ***In the bottom of this same Gall-bladder are found several Stones, but so light, that being thrown into Water, they will swim at the top.*** *Stones sometimes found in it.*

Of these I have observ'd sundry colours: sometimes yellow, sometimes black inclining to green, and sometimes speckl'd like Marble. These seem to be generated out of Choler, void of any Acrimony, which in regard it never boyls, never breaks out of the said *Gall-bladder*, but is harden'd within it by degrees into Stones, by the heat of the Liver. For- *Observation.*
merly I dissected a Person that dy'd of the Jaundice, after he had been for some years troubled with a *black* and *green Jaundice* *, in whose Gall-bladder I found a Stone somewhat black, and of an indifferent blackness.

* *I have twice in my life seen Patients afflicted with a green Jaundice: the one I cured; the other dyed, being given over by other Physicians, as uncurable. The Patient whom I cured, was all over of a yellowish green: he which dyed was of a dark or deep green. The cause or reason for this Distemper is rendred in our* Synopsis Medicinæ, lib. 4. cap. 5. Sect. 10. § 26. ad 36. *to which I refer you.* Salmon.

Ferneli's Patholog. l. 6. c. 5. gives us a Relation of a certain old man, who had such a large Stone in his Gall-bladder, filling the whole Concavity of it to that degree, that he might be thought to have no Bladder at all. Other innumerable Examples there are of Stones found in the Gall-bladder, frequent to be seen in the Writings of Physicians.

IX. ***The neck of the Bladder is narrower, and toward the upper parts is streightned into a thin passage, which ends in a common passage leading to the Intestines.*** *The Neck.*

X. ***In this neck, according to the Opinion of*** Andrew Laurentius, Vesalingius, ***and*** Bartholine, ***there are Valves to be discern'd, sometimes two, sometimes three, preventing the*** *Whether any Valves in it.*

Return into the Bladder of the Choler which ought to flow into the Inteſtines. But I could never obſerve any ſuch things; however, I obſerv'd the Egreſs of the Bladder to be moſt ſtrait, and the Neck of it to be full of many wrinkles, leſt the deſcent of the Choler ſhould be too eaſie and too ſlippery, and therefore to render the Evacuation the more ſlow. In like manner neither could *Riolanus* and *Gliſſon* find thoſe Valves. For the ſaid narrowneſs of the Neck ſeems to be order'd by Nature to that end, that the Choler being once got into its Bladder, ſhould not preſently return again, but ſtay for ſome time within, to acquire a ſharper Acrimony, and more fermentative quality *; from the nature and property of the place, and by the mixture of the ſharp Choler ſtill remaining in the Bladder, which being once well mingled with it, and thence raiſing a ſlight Effervescency in the Choler it ſelf, it happens that the wrinkles of the Neck being dilated and gaping by means of that diſtenſion, ſome part of it being attenuated and made more fluid by that Effervescency, cannot conveniently be contain'd, but is forced down to the Inteſtines. Of which ſee more *C.* 17. following.

* *This is ſomething of the Doctrine which we have maintained in the places aforecited of our* Synopſis Medicinæ; *which thing is worthy the ſerious conſideration of all the Sons of Art: and it is without doubt, the ſame kind of Juice, which being conveyed to other parts (as the Amygdalæ, maxillary Glandules, Womens Breaſts, Piſs-bladders, Pancreas, Seminal Veſſels, and Pores of the Skin,) by the Fermentum of the ſame parts is converted into the Humor proper to the ſame; (as Spittle, Milk, Urine, and Juice, Seed, and Sweat.)* Salmon.

The way of the Choler to the Bladder.

XI. *The Choler is carried to the Bladder through many ſmall Roots, ſcatter'd up and down in the Liver among many little Branches of the* Vena Cava *and* Vena Portæ, *(as has been ſaid in the foregoing Chapter,) which cloſing together into one paſſage, through that paſſage pour forth the Choler* ‖ *into the Gall-bladder.* But theſe Roots are ſo ſmall, that they are hardly to be ſeen; only the Trunk into which they all run, is to be found. And *Gliſſon* deſcribes the way of ſearching for it, and finding it out, *Anat. Hep. c.* 13. This Trunk we have often ſeen very apparent with ſome Roots in an Ox Liver, admitting a good big Bodkin; to which, at the entrance into the Bladder of the Gall, ſometimes a ſmall, and ſometimes a large Valve is affix'd, which hinders the return of the Choler out of the Bladder into the Liver. In Dogs, whoſe Liver is divided into ſeveral Lobes, we have often found, and viſibly ſhewn to the Standers by two or three Trunks. If you ask then, how it returns in Perſons that are troubled with the Jaundice? I anſwer that it does not return, but that the Choler which is generated in the Liver, for want of convenient Effervescency and Fermentation, is not ſeparated from the blood, and therefore never flows into the Bladder, but remains mix'd with the blood, and together with that is carried to the hollow Vein, the Heart, and the reſt of the Body:

‖ *That is, the Serous or Lymphaphatic Juice, which by the Fermentum of the Bladder, as aforeſaid, is changed into the Choleric Humor, for ſeveral and various intentions of Nature.* Salmon.

XII. *The Uſe of the Gall-bladder is to collect the Choler with which, in healthy Perſons, it is moderately repleniſh'd, yet not fill'd ſo full, but that it might contain half a ſpoonful more.* In a ſickly habit of body it is ſometimes ſwell'd and ſtuff'd with Choler; ſometimes, but very rarely, altogether empty. *The Uſe.*

XIII. *The other Choler Veſſel is the* Porus Bilarius, *call'd the Bilary Paſſage, which is an oblong Chanel, twice as large as the neck of the Bladder, proceeding from the Liver not far from the* Vena Portæ, *and conveighing the Choler receiv'd by the Liver into the common Chanel, which glides not only ſomewhat thicker and more dreggy through the broader Chanel, but alſo milder*; where it does not tarry by the way, or acquire a more eager Acrimony, either by a longer ſtop, or from the nature of the place, as the other already collected in the Bladder. *The* Bilary Porus.

XIV. *To this there are ſome that appropriate double Valves, preventing the regreſs of the Choler into the Liver; the one at its Exit out of the Liver, and the other at its Entrance into the* Ductus Communis. But others deny there are any ſuch *Valves*, becauſe they cannot be found by *Anatomiſts*. But Reaſon ſeems to perſwade us, if there are not two, yet that there ought to be one, ſeeing it is manifeſt that there is ſuch a *Valve* in the Trunk which hinders the regreſs of the Choler. For our parts, we ſhall forbear to determine the Controverſie, till our Eyes, and certain De- *The Valves.*

Demonstration shall give a definitive Sentence.

Whether two sorts of Choler.

XV. *Now here a Question may arise, Whether there be two sorts of Choler generated in the Liver, of which the one sort, being the sharper, flows into the Gall-bladder; and the other milder flows through the Choler Passage? I say, No; but that it is one and the same Choler, whose somewhat more feculent parts nevertheless more easily pass through the* Porus Bilarius, *as being broader, and by reason of their feculency are less eager; but the more thinner parts are conveigh'd into the Gall-bladder;* to the end they may there be made more sharp, and acquire a more efficacious fermentative power, as well from the Specific Temper of the Body, as from the Mixture of the sharp Choleric Juice remaining in the Bladder.

Differenses of Choler.

XVI. *But that the Choler, which glides through the* Porus Bilarius, *differs in some qualities from that which is contain'd in the Gall,* Malpigius *has experienc'd,* Lib. de liene, c. 6. *and found that which flows through the said* Porus *to be more mix'd and less sharp, nor coloured alike, and being heated by the fire, yields a most strong scent, which the other does not do.* Perhaps it may be objected, That many times there is a thick and slimy Choler found in the Gall-bladder, which for the most part is very insipid, and void of Acrimony. I answer, That it is not so thick when it first enters the Gall-bladder (for being thick and viscous, it could never pass through the narrow Passages of the Roots, but when the Gall-bladder is obstructed, or that the Choler for some other cause is detain'd within it longer than is requisite; then the thinner parts being dissipated by the heat of the Liver, the Choler becomes thick and viscous in it, contrary to its natural temper; and sometimes is dry'd to a stony hardness: which for the most part happens for this reason, because it has not a fermentative quality, strong enough to stir it up to the Effervescency, and so to timely expulsion. In like manner, I say, that the Choler becomes whitish and insipid in the Bladder, for want of that saltish and sow'rish Liquor that comes from the Spleen, by reason of the corruption or defect of which Liquor, the Liver begets vicious Choler *, which may easily happen in a sickly Constitution, wherein any other Humors in any other part of the Body, may alter from their natural habit.

**Or rather Juice, for the generating of Choler, as aforesaid.* Salmon.

The way of the Choler into the Bilary Porus.

XVII. *Now the* Porus Bilarius *receives that milder sort of Choler by means of innumerable Roots that are dispers'd through the Liver, which accompany the little Branches of the* Vena Portæ *to all parts of the Liver (some excepted, to which the Roots of the Gall-bladder are extended,) nay, they are wrapt about with one and the same Tunicle, arising from the Membrane that enfolds the Liver, in like manner as the Spermatic Vein and Artery;* and by means of that so closely stick one to another, that they cannot be separated one from another without tearing; in so much that at first sight they seem to be one and the same Vessel, and can only be discern'd to be distinct from the variety of the Colour, if they be held up to a clear light, which cannot be done but when the Liver is excarnated.

Sylvius his Opinion.

XVIII. Franciscus Sylvius de le Boe *is of opinion that they are not the little Branches of the* Vena Portæ *which are cover'd with one common Tunicle with the Roots of the Bilary Porus, but that they are the little Branches of the Hepatic Artery, which he reports that he saw discover'd and demonstrated by* John van Horn, Disputat. Med. 6. Thes. 52. *But without doubt, in that demonstration the little Gall Branches, which because of the Liquor contain'd in them, are not so ruddy as the Veins, were by* Van Horn *taken for Arteries.* But that which *Sylvius* adds, That the Hepatic Artery, for the most part inclosed within the common Covering, is inserted into the little Branches of the Hepatic Bilary Porus, I will believe it when I see it. I know there is a very close conjunction of the little Branches of the *Porta* and the *Gall Vessels*, but of no Artery. And hence, that there is any Insertion of any Artery by *Anastomoses* into the Bilary Vessels, must be prov'd before my Eyes by demonstration, before I can give credit to it.

The Choler is taken from the Substance of the Liver.

XIX. *And therefore the Roots of the* Porus *receive the Choler or Juice generating of it from the Substance of the*

the Liver it self, into which several little Branches of the Vena Portæ, *few of the Hepatic Arteries empty their Blood, which is presently alter'd therein, and by the mixture of sulphury and saltish Particles is concocted after a new manner, and in many of its Particles grows bitter, and turns into Choler.* Which Choleric Particles, by means of the Glandulous Balls (of which *Malpigius* asserts the Substance of the Liver chiefly to consist) are separated from the other bloody Particles, which are less alter'd by that Concoction, and suck'd up by the Roots of the *Porus Biliarius* and Gall-bladder.

XX. *And, as has been already said of the Arteries, there are many that feign several* Anastomoses *between the Extremities of the Twigs of the* Vena Portæ *and the Bilary Roots, although there are no such things as we have shew'n in the foregoing Chapter.* And which *Glisson* clearly evinces by many Reasons and Experience, ought not to be; in regard that the whole Alteration of the Blood into Choler, and separation and transfusion of it out of the Veins into the Bilary Vessels, is made by means of the Glandulous Balls.

The Ductus Cholidochus.

XXI. *Now the Choler flowing as well from the Liver through the Bilary Porus, as out of the Gall-bladder, meets in one common Chanel, call'd the* Ductus Cholidochus, *which is a* Meatus *Chanel or Passage made out of the Necks of the Bilary Porus, and the Gall-bladder meeting together.*

It is for the most part solitary.

XXII. *This goes for the most part alone, sometimes admitting the Pancreatic Chanel at the end of it (which is very frequent in a Man, seldom in a Dog,) toward the end of the* Duodenum, *or beginning of the* Jejunum, *obliquely between both Tunicles of the Intestine, for the most part single, seldom double about the end, with an Insertion of about a fingers breadth, opens toward the hollow of the Intestine, and empties its Choler into the Guts, as well immediately out of the Liver, as out of the Vesicle of the Gall.* Others, and not without reason, rather believe that this whole Chanel is no more than the *Bilary Porus*, extended from the Liver to the Guts, into which, on the side, is inserted the Neck of the Gall-bladder.

Its Valves.

XXIII. Vesalius *and* Sylvius *assert that there are certain loose little Membranes fix'd to the Orifice of this Chanel like Valves, preventing the Return of the Choler from the Guts to the Liver.* But if we inquire more diligently, there will be no membranous Valves to be found here, only an Internal loose Membrane of the Intestine, depress'd by the concocted Nourishment passing thorough, so shuts up the way, that no Liquor can enter the Chanel from the Guts, which when the Choler descends and seeks to go forth out of the Chanel, presently opens and gives it a free Passage.

Glisson *would have it to be a Sphincter Muscle.*

XXIV. Glisson *allows to that part of the Chanel which obliquely enters and bores the Gut, Fibres like Rings, which he believes are open'd like the Sphincter Muscles, when plenty of Choler makes its way, but are then contracted again when that Choler is pass'd away, till more new Choler comes.* And these Fibres, as he says, prevent any Humour from ascending from the Guts to the Liver or Gall-bladder. But perhaps *Glisson* took that little piece of Flesh which bunches out at the Exit of the *Ductus Cholidochus* into the Guts, for some little Shincter Muscle.

An Objection answer'd.

XXV. *But because that some oblique Passage into the Guts is very narrow, and the Channel broad, hence the other seems not able to transmit hardly the tenth part of the Choler through a Channel no wider than a Goose-Quill, therefore* Glisson *thought that the foresaid* Ductus Cholidochus, *did not only do the Duty of Chanels to conveigh the Choler, but also perform'd the Office of Receptacles or Bladders, to contain and keep it for some time.* But in the Dissections of dead Carcasses 'tis very rarely seen that any Choler is contain'd in those Vessels. And therefore 'tis more probable that the Choler most usually descends in a small Quantity from the Liver and the Gall-Bladder (for a small Quantity serves to procure Effervescency or Fermentation of the *Chylus*, together with the *Pancreatic* Juice) and therefore by reason there is so little of it, it may easily pass through the Streights of the oblique Passage. Which Passage however being obstructed contrary to Nature, then the Choler happens to stop in the *Ductus Cholidochus*, as it were

in

in some Bladder, which never happens according to Nature in a state of Health. For then a little Choler somewhat sharp, suffices to provoke Evacuation, to cause a Distention of the *Ductus*, and to open the Passages.

An unusual Constitution.

XXVI. *Here we must observe by the way a certain Constitution of the Gall Vessels seldome happening, which we saw in the Year* 1668. *in the Dissection of a Woman about thirty Years of Age, who having been long troubled with a Dropsy not very terrible, but partly an* Anasacra, *partly an* Ascites, *at length dy'd of it.* In this Body we found the Liver not Ruddy, but inclining to Yellow: In the rest of the Bowels there was hardly any Yellowness to be observ'd, and an overabounding serous Humor fill'd the hollowness of the *Abdomen*. The Gall-Bladder was White both within and without, as also the Chanel running forth toward the *Ductus Cholidochus Communis*; and so large as to admit almost a Mans little Finger. But neither in the Bladder, nor in the Chanel was any Choler at all, but a white kind of Juice, very Viscous, and not very much. Nevertheless in the common *Ductus Cholidochus* (which is the Bilarie Porus extended to the Guts) just entring into the *Duodenum*, there was contained an indifferent Quantity of yellow Choler, which by the yellow Choler within, was plainly discovered to have flow'd into the *Duodenum*.

A white Gall-Bladder.

An Argument for the Passage of Choler through the bilary Pore.

XXVII. *Hence we may raise a great Argument against those who affirm that no Choler at all flows from the Liver through the* Bilary Porus *to the Guts, but that part of the Choler flowing from the Vesicle, breaks forth into the* Duodenum, *and part ascends through the* Bilary Porus, *and so enters the Liver.* Which that it cannot be done, is manifest from this Observation. For seeing that no Choler was contained in the Vesicle, nor in its Chanel, and yet the Choler was carried to the *Duodenum*, it could be conveighed from no other Part than from the Liver, through the *Bilary Porus*, and the common *Ductus Cholidochus*, wherein there was Choler also found.

Whether the Choler flows continually.

XXVIII. *Here a Question arises, whether the Choler descends to the Guts continually, and with an equal Course? For Resolution of which Question, I think it proper to distinguish between that Choler which flows from the Liver through the* Porus, *and that which falls from the Gall-Bladder.* Now that some Choler, tho' but a small Quantity continually flows to the Guts, and is presently mix'd with the *Pancreatic* Juice, flowing also in a small Quantity, is apparent to Sight in the Dissection of living Creatures. But I should think that to be the milder sort, descending from the Liver through the *Bilary Porus*; not the sharper and more fermentative Sort that comes from the Bladder, as being that, which by reason of the narrowness of the Neck of the Bladder, does not seem to glide out of its place, unless when by its Effervescency it dilates the Bladder and its Neck, and makes way for it self. And so I think that this Sort does not flow but by Intervals out of the Bladder; and more especially when the Gall-Bladder is pressed by the Stomach full of Meat, as resting upon the right Side of it: And when by reason of the Concoction and Fermentation so near it, the Choler also begins to boyl in the said Gall-Bladder. For that same sharp Choleric Ferment is not flowing continually, nor do the Intestines always require the same Quantity of it. But chiefly then (when a new *Chylus*, being to be separated from the Guts) it either slides, or is about to slide down into 'em, *Glisson* on the other side, believes, that when the Stomach is full, or that the *Chylus* is descending to the lower Parts, the flowing of the Choler is not thereby promoted, but rather hinder'd. But according to the Opinion of *Galen* and the Ancients, he asserts, that the Choler stays for some time in the *Gall-Vessels*, and afterwards of a suddain is forced down from thence into the Guts; and does the Office of a Clyster to purge 'em. Which was that which before *Glisson*, *Spigelius* both believed and maintained: Tho' according to the Opinion of these two Persons the Choler would flow into the Intestines when there was no need of it. But the Ground of this Error was this, That *Galen* and his Followers thought the Choler to be a meer Excrement, and that it only promoted the Evacuation of the Dreggs of Nourishment, but were ignorant that it is altogether necessary to the Fermentation of the *Chylus*. Of which more in the following Chapter.

The unusual Chanel.

XXIX. *Besides the common Chanel already mentioned, in the Year* 1655.

in April, *I publicly shew'd in the Anatomy Theater another unusual Chanel, thinner than the other usual Chanel, which nevertheless was there at the same time, and full of Yellow Choler, which had no Correspondency with the* Bilary Porus, *or the common* Ductus Cholidochus *already mentioned, but had its Rise apart above the Neck of the Gall-Bladder, where the Bladder begins to be streightened toward the Neck:* Besides that it was carried apart by it self to the *Duodenum*, into which it was inserted about a Fingers breadth from the Insertion of the common *Ductus Cholidochus*. The next Year in another Body we observed something that was rare, that is to say besides the usual *Ductus Cholidochus*, another unusual *Meatus* or Chanel, extended from the middle of the Gall-Bladder, directly to that part of the Gut *Colon* adjoyning to it. And thus sometimes we shall observe a Chanel to extend it self from the Gall-Bladder to the *Pylorus*, and sometimes to the bottom of the Stomach. But these are the unusual Sports and Varieties of Nature, seldome to be seen.

A Digression.

XXX. *From what has been said, it is apparent that Choler is made in the* Liver, * *and from hence flows forth from the Choler Vessels into the Guts.* It remains now that we speak something of its Generation and its Use.

* *That is to say the Juice generating Choler more specially, because the same Juice cannot be brought from other remote Parts at the same time.* Salmon.

What Choler is.

XXXI. *Choler then is a Fermentaceous Juice prepar'd in the Liver out of the Venal Blood, and specific splenetic Juice.* (a)

(a) *That is to say, the said Juice is prepared and fitted in the Liver for Separation, to be received into the Gall-Bladder, and there by the Fermentum inherent, to be perfected, and made that choleric Juice, which is bitter, and so sent into the Jejunum.* Salmon.

XXXII. *It is generated as well out of the Sulphury and Unctuous Particles of the Venal Blood, as the Salt and Acid Particles of the sowrish Liquor coming from the Spleen, together with those that flow through the* Vena Portæ, *being beforehand Concocted, mixed and prepared in the Liver after a specific manner.* For the sulphureous Juice, altho' it be sweetish of it self, being for some time concocted with the saltish Ferment, grows bitter and changes its Colour. Now that this is the matter of which Choler Consists, the Art of Chymistry teaches us, as being that by which but little fixed Salt and Water, but much volatil Salt and Oyle may be extracted from the Choler of the Bladder, if in its natural Condition.

The Motion of Choler.

XXXIII. *This Choler concocted in the Liver, one Part of it, being the thinnest, remaining mix'd with the Blood, is carried to the* Vena Cava, *and therein, infuses into the Blood a certain fermentative Quality, by which it is made fit to be presently dilated in the Heart.* The other Part more bitter and more fermentaceous, partly of a milder Quality, flows through the *Bilary Porus* to the Intestins; and partly forc'd into the Gall-Bladder, from the Property of the Place and the Juice abiding in it, becomes yet more bitter and sharp, and acquires a stronger fermentative Quality.

Whether Choler be generated in other Parts.

XXXIV. *From the Ignorance of this Motion of the Choler, some famous Physicians, as* Galen, Lud. Mercator, Helmont, Krempsius, Hoffman, *and others made a Doubt whether some Choler were not generated in the Stomach, Heart, Head, and Kidneys, as well as in the Liver and Gall-Vessels; which seems to be prov'd by the Vomiting of Choler, in the Disease call'd* Cholera, *and the yellow Froth sometimes swimming upon extracted Blood, the Bitterness of the Excrements contain'd in the Ears, and the choleric Colour of Urines.* But their Mistake proceeded from hence, that they thought Choler to be a meer Excrement, and that it was all of it sent through the Gall-Vessels to the Gutts, and from thence evacuated; and were ignorant that in the Distemper called *Cholera*, being forc'd out of the Bladder into the Guts, the greatest part of it ascended into the Stomach, and so was vomited up; as also that a good part of it was carried to the Heart, and mixed for Fermentation sake with the Blood, and circulated with the Blood through all the Body, and hence the Colour of it appeared in the Froth swimming upon the Blood, and in Urines; Hence also the Colour and Tast of

of it proceeded in the Excrements of the Ears, tho' it be not generated in the Parts that evacuate those Excrements.

The Place generating Choler, depends upon the inner Tunicle of the Gall-Bladder, & the Choler residing therein.

XXXV. *The property of Place conducing to the Generation of Choler, depends partly upon the inner Tunicle of the Gall-Bladder it self, which is endu'd with a peculiar fermentaceous Quality: Partly upon the Choler residing in that Bladder, which by a longer Stay, being there fermented and Boyling, becomes more sharp and bitter, and by that means ferments and renders more sharp the fresh milder Choler flowing out of the Liver into the Bladder; and so by continuance the sharper Choler boyling, flows out of the Bladder, and the milder taking its Room, and staying there, becomes more sharp.* Nevertheless the Choler acquires either a more intense or remiss Acrimony, according as more or fewer, and those more sharp or milder, saltish and sowrish Juices, flowing from the Spleen to the Liver, and there are intermixt with the sulphurous Juice, and are more or less concocted. For if the Juice that flows from the splenetic Branch, be either less in Quantity or less Sharp, the Choler becomes less Sharp and less effectual to promote a Fermentative Effervescency, which growing Clammy in the Choler Vessels of the Liver, and Bladder, as not being sufficiently attenuated by that weak Effervescency, causes the Jaundice and many other Obstructions. But if the Liquor that flows from the Spleen be too sharp, then the Choler becomes too sharp and eager as well in the *Vasa Bilaria* of the Liver, as in the Gall-Bladder, and that Acrimony corroding too violently in the Fermentation, causes *great Pains, Cholera's, Dysenteries*, and other Distempers, especially if a sowre *Pancreatic* Juice flow into the Intestins at the same time.

A new Opinion.

XXXVI. Francis de le Boe Sylvius, *considering the very small and almost invincible Passages, through which the Choler is conveighed from the Liver to the Gall-Bladder, conceiv'd quite another Opinion of its Generation. For he imagins Choler to be generated out of the most similar Parts of the Blood conveighed through the Cystic Arteries to the Gall-Bladder, and penetrating by degrees through the Pores of its Tunicle into the Concavity it self, and there presently changing into the same Nature with the rest of the Choler; in like manner as a Jugg of Wine, being poured into a Tub of Vinegar streight becomes Vinegar.* *

* *This Opinion of* Sylvius *comes very near the Truth, if it be considered as to the Particles or Matter of which Choler is generated: But as to the Ways and Passages leading that Matter to the proper Place, I am very confident he is wide from the Mark: For the Passages out of the Liver into the Gall-Bladder (which are indeed Strainers) are evident in many Persons to the naked Eyes; but with a Microscope, they appear famous. So that to deny them, a man must absolutely deny his Senses.* Salmon.

Regius is also of the same Opinion; *Philos. Natur. l.* 4. *c.* 12. who nevertheless seems to acknowledg the *Bilarie Roots*, extracting the Choler out of the venal Blood infused into the Liver. But these three things destroy the Fiction of *Sylvius*. 1. For that never any Signs appear of any Blood infused into the Hollow of the Gall-Bladder; no, not so much as the least Drop ever observ'd by any Anatomists; whereas in all other Parts wherein any Juice, Liquor, or Spirit, is to be made of Blood, there are some marks of Blood that manifestly appear, as in the Brain and Testicles. 2. Because that Choler is generated in some Creatures that are said to be destitute of a Gall-Bladder, as in the Hart, the Fallow Deer, the Camel, *&c.* In which Creatures it cannot be generated in the *Vesicula Fellis*, out of the Blood that glides through the Arteries, but being generated in the Liver it self, flows through the *Bilary Porus*. 3. Because those Vessels are sometimes obstructed through which the Choler is conveighed to the *Porus*, and Gall-Bladder, which is the cause of the Jaundice, by reason of the great Quantity of Choler diffused over the whole Body; when as it is apparent that no Choler was genetated in the mean time in the *Porus*, or *empty Gall-Bladder*, tho' the *Cystic Arteries* conveighed Blood sufficient to the Bladder as they used to do. 4. Because that in Gluttons and great Drinkers, the Jaundice proceeding from a hot Distemper of the Liver, cannot be caused by the arterial Blood being chang'd into Choler, which was equally both before and then carried to the Gall-Bladder; nor is there any Reason it should then be more copiously conveighed thither to be changed into Choler, than at any other time. 5. Because this Opinion seems to presuppose as if all the whole Mass of Choler were generated in the

Gall-Bladder, whereas it is all generated in the Liver * before it comes to the Bladder: As is apparent from hence, for that very much Choler flows through the *Porus* to the Inteſtin, which never comes near the Gall-Bladder; and therefore could not be generated out of the Particles of the arterial Blood, gliding into the Bladder. 6. Becauſe this Opinion ſeems alſo to maintain, that real Choler does not pre-exiſt in the Blood, and that the Particles of it being ſeparated from the Blood, flow down into the hollow of the Bladder, and are there made perfect Choler. But the Vanity of this Opinion we have at large demonſtrated. *C.* 10. *artit. de generat. Suc. pancreat.*

* *I beg the Diverſion of the Author in believing of this, ſince the contrary can be prov'd by ocular Demonſtration.* Salmon.

The Inſertion of the Hepatic Artery into the Branches of the Porus uncertain.

XXXVII. *Moreover what* Sylvius, *in his Addition to his Diſputation, alledges for the Support of his Opinion, do not ſeem to be of ſo much Weight, as to eſtabliſh his Doctrine. For the Inſertion of the Hepatic Artery into the Branches of the* Porus *does not prove it, becauſe the Inſertion it ſelf is as yet very much queſtioned, as being grounded more upon uncertain Belief than certain Sight, and therefore to be laid up among thoſe Doubts which are not to be credited unleſs viſible to the Eyes.* In like manner alſo his Experiment made in a Dogg, by means of a little Pipe thruſt into the Hepatic Artery, and blowing through it into the Gall-Bladder, is very uncertain, even by the Confeſſion of *Sylvius* himſelf; *Theſ.* 54. Moreover if the Wind could be ſo eaſily blown into the Concavity of the Gall-Bladder, ſtore of Blood might eaſily be alſo forc'd into it by the Protruſion of the *Heart* and the *Cyſtic Arterys*, which never was yet obſerv'd by any Perſon.

Whether Choler be only ſeparated and not generated.

XXXVIII. *But* Malpigius *abſolutely denys the Generation of Choler,* l. de hep. l. 3. *believing that Choler is not generated out of any Blood by the Mixture and Concoction of ſeveral Humors in the Blood; but that it is only ſeparated from the Blood by means of the Glandulous Balls of the* Liver *it ſelf, and that ſuch as it is, it pre-exiſts in the Blood, and therefore has need of nothing more than Separation.* Which Separation he thinks to be thus brought to paſs. *Neither*, ſays he, *is there any Neceſſity for* Suction, *to the End the Choler ſhould be ſent to the Inteſtins or Gall-Bladder through the* Porus, *for a ſtrong and continued Compreſſion of the Glandules of the Liver, cauſed by continual Reſpiration, and the Impulſe of the Blood running through the Arteries, and the Branches of the* Portæ *promote the Office of Separation in the* Glandulous Balls, *and its Propulſion through the Branches of the* Porus, *as it happens in other conglomerated, and conglobated Kernels, in the Parotides and the like.*

XXXIX. ***But herein the learned Gentleman is very much miſtaken, for there is in the Blood coming to the Liver and bilarie Veſſels, a certain Subſtance intended for Choler, but not Choler it ſelf.*** *

* *This Aſſertion of the learned Author agrees with Truth it ſelf, and with what we have before (in ſeveral places) declared concerning this matter, and without doubt in this Senſe he is always to be underſtood, when he ſpeaks at any time of the Separation of Choler from the Blood in the Liver,* viz. *That it is a certain Subſtance intended for Choler, but not Choler it ſelf: The which Subſtance or Juice is neither Yellow nor Bitter, nor Choler, nor contains any Choler till it is tranſmuted thereinto by the proper Ferment of the Part.* Salmon.

As there is in the Nouriſhment a certain Matter, out of which a *Chylus* is to be prepared by the mixture of a ſpecific Ferment, and the ſpecific Concoction of the Stomach, which is not the *Chylus* it ſelf: And in the *Chylus* there is the Subſtance of Blood, but not the Blood it ſelf: And as theſe Humors the *Chylus* and *Blood* are made by ſpecific Fermentations and Concoctions in the Bowels, deſign'd for that purpoſe, of thoſe things which before they were not; in like manner the yellow and bitter Choler, is made out of ſweet Blood, and acid ſplenic Juice (of which neither is yellow or bitter, neither of 'em is Choler, or contain any Choler in themſelves) being mix'd together in the Liver, and fermented and concocted after a ſpecific Manner: And the chiefeſt part of it (for ſome of the thinneſt remains mix'd with the Blood, is carried to the *Vena Cava* and the *Heart*, is ſeparated from the reſt of the Blood, being unfit to be changed into Choler, and is carried to the Roots of the *bilary* Veſſels, and ſo by degrees proceeds to the *Porus* and *bilarie Bladder*. In like manner as in Chymiſtry, various Bodies are changed into Metals, which before were not Metals: And out of things void of Colour, mixed and boyling together, a new Colour is raiſed, which was not in the Subſtance

ſtance before; as out of white Salt-Tartar, and tranſparent Spirit of Wine is produced a red Colour. And hence it may be certainly concluded, that there is not any ſingle Separation of Choler pre-exiſtent in the Blood, but a new Generation of Choler which was not before. As to the Arguments which *Malpigius* alledges of the pre-exiſtency of Urine in the Blood, and other things too prolix to be here cited, they are not of ſo much Moment as to prove that pre-exiſtency of Choler in the Blood, and ſingle Separation from it; when as there is not the ſame Reaſon for the Separation of the ſuperfluous Serum pre-exiſtent, and the Generation of neceſſary Choler not pre-exiſtent. Of this ſee more in C. 10. already cited.

Colour and Taſt.

XL. *The natural Colour of Choler is yellow, the Taſt bitter, and ſomewhat tart, the Subſtance Fluid. But by ſeveral Cauſes, all theſe three in a ſickly habit of Body ſuffer Alteration, as the Blood is either in a bad or good Condition, or the ſplenetic Juice conveighed to the Liver is more or leſs Salt, Acid, Sowre, or Auſtere.* For hence ariſe many preternatural Qualitys of Choler, and as they vary, happen *Fevers, Cholerick Diſtempers, Dyſenteries, Jaundice, Colic Pains, and ſeveral other Diſeaſes.* Which *Regner Graef* affirms to ariſe only from the Corruption of the *Pancreatic Juice*; but contrary to Experience, for the Diſſections of Bodys that have been brought to the Grave by thoſe Diſeaſes, frequently tell us, that when the Sweetbread has been firm and ſound, the Cauſe of the Diſeaſe has lain hid in the Liver, Bladder, and other *Bilarie* Veſſels; tho' we do not deny but that the ſame Diſeaſes may ariſe from a vitious *Pancreas*. Hence there are ſeveral Alterations of the Colour of the Choler, which is ſometimes Pale, ſometimes Saffron Coloured, ſometimes Red, ſometimes Ruſt-coloured, and ſometimes inclining to Black. Nevertheleſs *Regner de Graef*, not conſidering the Flux of the ſplenetic Juice to the Liver, has conceiv'd a quite different Opinion concerning theſe preternatural Colours: Believing that ſame variety of Colours happens to the Choler not in the Gall-Bladder, nor in the Choler Veſſels, but in the *Duodenum*, and that by the Mixture of the *Pancreatic*, acid or ſowre Juice, no otherwiſe than if it ſhould change its natural Yellow into any other Colour in the Gall-Bladder it ſelf. But in the Diſſections of Bodys that have dy'd in our Hoſpital, we have demonſtratively and frequently ſhewn a Green *Eruginous* or Ruſt Coloured, and ſometimes a blackiſh Colour in the Bladder it ſelf before the mixture of the *Pancreatic* Juice; nay in the Daughter of the Lord *Viich*, who dy'd of an *Eruginous* Flux of the Belly, and after her Death by me diſſected in the ſight of ſeveral Phyſicians, we found the Gall-Bladder ſwell'd to the bigneſs of a Hens Egg, and full of an *Eruginous Choler*: Which we have alſo obſerv'd in ſome other Infants that have dy'd of the ſame *Diarrhœa*, as alſo in others who have dy'd of the Diſeaſe *Cholera*. So that the various Colours of the Choler do not always proceed from the Mixture of the *Pancreatic Juice* in the Inteſtins, but are often acquired in the Gall-Bladder, and Bilary Veſſels, in the ſame manner as we have already rehearſed. Of which ſee more in the preceding C. 7.

Variety of Colours from variety of Humors, confirm'd by Obſervation.

XLI. *But now that the ſeveral Humors engendered in the Body being mix'd with the Blood, according to the diverſity of Qualitys, occaſion a great Variety of Colour, is apparent from theſe Experiments which we have obſerv'd in the Gall of an Ox.* Which being mix'd with acid things, as Oyle of Vitriol, or Tartar, or Vinegar firſt boyl'd a little, then growing very thick, became of a green Colour, but being ſtrongly ſhaken in a Flaggon with theſe Acids turn'd to a whitiſh Colour. Being mix'd with ordinary Cinamon Water, it became more Thin, more Yellow, and more Fluid: But being mix'd with Spirit of Wine; preſently ſeparated from it, and ſetled at the Bottom. Laſtly, being mixed with fair Water, a little Gall dyed a great deal of Water of a Saffron Colour.

Whether the Choler aſcend to the Liver through the Porus.

XLII. *Of the motion of the Choler we have ſpoken; that is to ſay, that ſome part of it mixed with the Blood, tends from the Liver to the* Vena Cava, *but that the greateſt Part is carried to the* Bilary *Veſſels, and ſo through the* Porus *and Gall-Bladder to the Inteſtines.* But the Opinions of others are far different concerning this Matter. *Veſalius* (following the Judgment of *Galen*) writes that the Choler is drawn out of the *Porus* to the *Gall-bladder*, and from thence is forced down to the *Inteſtines*. But this Opinion fails, becauſe it does not demonſtrate the Way thro' which the Choler comes from the *Porus* to the Gall-bladder. To which it

cannot aſcend through the Chanel of the Gall-bladder, and through that deſcend again from the Gall-bladder to the Inteſtines, for that in the parts of our Body there is neither any drawing of Humors, nor any natural going and returning the ſame way. *Fallopius l.* 3. *Obſerv. c.* 7. believes that the Choler of the Liver does not aſcend, unleſs when the Mouth of the common *meatus Cholidochus* is ſtopped by ſome Cauſe or other, but that upon ſuch an Occaſion it may be done. But the Wrinkles and Narrowneſs of the Neck of the Gall-bladder contradict this Opinion, altogether impeding the Ingreſs of the Choler aſcending this way; ſo that the Choler thruſt forward from the Gall-bladder it ſelf by compreſſing into the common *Ductus Cholidochus*, can by no means be repell'd back into the Gall-bladder by a contrary Compreſſion of the ſaid *Ductus*. From theſe *Backius* very much differs, *Diſſert. de corde c.* 3. & 6. who aſſerts that the Choler is carried directly out of the *Cyſtis* to the common *Ductus Cholidochus*, but that the Extremity of it, which ends in the Inteſtines, is ſo fram'd, that it does not permit the Exit of the *Choler*, but readily gives way to the *Chylus* deſcending from the Stomach; and ſuffers in like manner its aſcent to the Liver. And that it communicates as well the *Chylus*, as more eſpecially a part of the Choler through the ſame Hole to the *Pancreatic Wirtzungian Ductus*. But the very Sight it ſelf evinces and deſtroys the Opinion of *Backius*, by which it appears to the Eye in the Diſſections of living Animals, that as well the *Choler* as the *Pancreatic Juice* break forth from their own Places into the *Duodenum*, but that nothing of the *Chylus* can enter through that way out of the Guts by a contrary Conveighance. *Francis de le Boe Sylvius*, introduces ſtill another Motion of the *Chylus*, and aſſerts that the Choler which is bred in the Bladder flows to the common *Ductus Cholidochus*, and is carried from thence partly to the Guts, partly aſcends through the bilary *Porus* to the Liver, and there being mix'd with the Blood renders it more thin; but that no blood flows from the Liver through the *Porus* to the Inteſtines. And this in his *Additament* he proves from hence, becauſe that by blowing through a Reed there is a Paſſage open from the *Porus* to the Liver. A moſt egregious Conſequence; and this is ſuch another. The breath blown through a Pipe into the *Ureter*, paſſes into the Kidney, and farther into the *Emulgent Vein*, and *Vena Cava*, therefore the *Urinous Serum* is carried out of the *Bladder* through the *Ureter* to the *Kidney*. Certainly it would be very ſtrange, if the Choler which is bred in the Liver, and from thence once empty'd into the Veſicle, ſhould return through the *Porus* to the Liver. But the Falſhood of this Opinion appears from many things already ſaid. Firſt from the rare Conſtitution of the Gall Veſſels: And the Force of it is quite enervated by the Experiment of the perſpicacious *Malpigius*, *l. de hep. c.* 7. *In a Cat*, ſaith he, *of a few Months old, where the Gall-bladder is conſpicuouſly prominent, I have ty'd the Neck of the Cyſtis with a Thread, and empty'd it out of a Wound in the Middle. Then have I again bound the Extremity of the* Ductus Cholidochus, *where it opens into the Inteſtin: Then the Creature ſtill living for ſome convenient ſpace of time, I have found the intercepted bilary Porus extreamly ſwell'd, and a Portion of the common* Ductus Cholidochus. *And that I might prevent all Poſſibility of Separating the Choler by the help of the Cyſtis, after I had firſt ty'd a hard Knot in the Neck of it, I cut off the Cyſtis it ſelf, and threw it away. And yet I found the ſame Swelling follow in the hollow'd Pores by reaſon of the flowing Choler. Moreover I try'd with my Finger to drive upward the Choler contained in the Veſſels that ſo ſwell'd, yet would it return with a Force, nor could be kept back unleſs with an extraordinary Violence.* A little after he adds, *It is moſt certain, from many times repeated Obſervation, that the Extremity of the Cyſtic Paſſage being bound, ſo that not the leaſt part of the Subſtance of the Cyſtis or of its Neck, remain beyond the Ligature, but that only the common* Ductus Cholidochus, *and the bilary Porus may run directly toward the Inteſtines; and then tying another Knot near the* Jejunum, *a remarkable Quantity of Choler will be collected together, and evacuated out of a ſmall Wound made beyond the Ligature in the mid Way; which Knot may be ſeveral times unty'd, that the* Porus Bilarius *being plentifully fill'd may be emptied again.*

XLIII. *To which Experiment may be added three or four Obſervations of* Riolanus, Anthropog. l. 2. c. 22. *From whence it appears as plain as Day, that the Choler flowing from the Gall-bladder never aſcends thorough the Bilary Porus to the Liver*; And that no Choler often deſcends from the

the bladder, yet in the interim flows in great quantity from the *Liver* through the *Porus Communis* to the Inteſtines, and therein, if it be endu'd with bad qualities, produces *Diarrhœas*, *Dyſenteries*, the Diſeaſe *Cholera*, *cruel Gripings*, and other Diſtempers.

The Uſe of the Choler. XLIV. *Concerning the uſe of the Bladder, there have been hitherto great Diſputes among the moſt Eminent Doctors.* Ariſtotle *thought it to be ſeparated from the Blood, as a meer noxious Excrement; whoſe Opinion is followed by many.* And hence it is that *Bauhinus*, *Anat. l.* 1. *c.*45. makes a doubt whether the Collection of the Choler in the Bladder be neceſſary to Life; when the ancients affirm'd the cauſe of long life to be the emptineſs of the Gall-bladder, deducing their Argument from *Harts*, that have no Gall, and yet live long. *Haly Abbas*, and *Avicen*, ſay that it heats and ſtrengthens the Liver, and helps its Concoction. *Zirbus* writes, that it defends the Liver and other parts from *Putrefaction*. Which Opinion, tho' it be exploded by *Veſalius*, yet does it not diſpleaſe *Riolanus*. *Helmont* aſſerts it to be the Balſom of the Liver, and all the Blood. *Gliſſon* aſſerts that it does not only preſerve the Liver from Putrefaction, but prevents its Obſtructions, purifies the Blood, and hinders its Coagulation. *Veſlingius* alſo ſays that it preſerves the very *Chylus* from Putrefaction. Many *Neoterics*, according to the Opinion of *Galen*, have deſign'd only to promote the Evacuation of the Excrements out of the Guts; which *Bartholine* ſays, are thereby made fluid, and fit for motion. And thus all have made a doubt concerning the Uſe of this Noble Juice, which is found to be wanting in no Man, and which no Man can live without: and of which *Fernelius* writes, that many People have dy'd, in whom there has been found no other cauſe of their Death, than that the Gall-bladder was altogether empty of Gall.

Its chief Uſe is for Fermentation. XLV. *Manifeſt therefore it is, that Choler has a more noble Uſe, than hitherto has been aſcrib'd to it by Phyſicians and Philoſophers. And indeed the chiefeſt Uſe of it is to be ſerviceable to Fermentation.* Of which more at large *c.* 17.

CHAP. XVI.

Of the Spleen.

The names. I. THE *Spleen, call'd by the Latines* Splen, *by the Greeks* σπλὴν, *is an Organic Part, or Bowel ſeated in the left* Hypochondrium, *under the* Diaphragma, *between the Stomach and the Ribs.*

Unuſual Situation. II. *It is very rare, or rather prodigious, as both* Ariſtotle *and* Pliny *teſtifie, that the Spleen ſhould change places with the Liver, that is, that this ſhould be in the left, and the other in the right* Hypochondrium, *which nevertheleſs has been obſerv'd by* Cornelius Gemma, *and* Talentonius. And ſuch an unuſual Accident *Cattierus* deſcribes; and *Bartholine* relates two or three Hiſtories to the ſame purpoſe, *Obſervat. Anat. Rar. Cent.* 2. *Hiſt.* Alſo it is as unuſual for the *Spleen* to be wanting; which defect nevertheleſs *Hollerius* reports that he ſaw in a certain Woman, and was found in *Ortelius*, as has been ſaid *c.*14. *Andrew Laurentius* alſo makes mention of a Body diſſected at *Paris*, that had no *Spleen*; in which the Splenetick Branch ended in a ſmall Glandulous Body. Thus *Kerckringius* in his *Anat. Obſerv.* writes, that in two Births diſſected at *Amſterdam*, he obſerv'd the *Spleen* to be wanting. *Ariſtotle* alſo teſtifies that the *Spleen* is wanting in ſeveral Creatures, *L.* 3. *de part. Animal. All Creatures*, ſaith he, *that have Blood have a Liver, but all have not a Spleen.* And *c.* 24. *All moſt perfect Creatures only have a Spleen.* Thus *Riolanus*, following *Ariſtotle's* Opinion, *Creatures that have none or very ſmall Lungs, have none or a very ſmall Spleen.* *Ent* alſo in *Apolog.* writes that he has obſerv'd ſeveral Birds to have no *Spleen.*

The number. III. *In Men it is generally but one, and ſeldom exceeds that number.* Nevertheleſs *Cabrolius*, *Obſerv.* 15. as alſo *Poſthius*, and *Dominic de Marchettis*, have found two. *Fallopius* obſerves, *in Obſerv.* that he has ſeen three; frequently in Dogs there are two, not ſo often three; unequal in bigneſs; out of each of which there is a veſſel extended to the Splenetick branch. And the ſame thing perhaps may fall out in other Creatures. For *Ariſtotle de Generat. Animal. l.*4. *c.*4. writes that ſome brute Creatures have a double

double *Spleen*; and that some have none at all.

The Connexion.

IV. *The Convex part of it is knit to the* Diaphragma, *not so fast and tite as the Liver, but superficially, as also to the left Kidney by small membranous Fibres springing from the* Peritonæum. And yet in *Novemb.* 1668. we found so fast a Connexion of it to the *Diaphragma*, the *left Kidney*, and the *left Lobe of the Liver*, extended so far, that the Connexion could hardly be sever'd without dilaceration: but this rarely happens. The flat part adheres to the Caul, and the adjoyning Parts, and being so bound, in sane bodies seldom descends beyond the lowest Rib: but the Ligaments being loosen'd, it is felt in a lower place, to the great disturbance of health; but the Ligaments being quite broken, sometimes it slides down into the *Hypogastrium*; which *Cabrolius* observ'd to have happened to a certain Noble Man; whose *Spleen* swam upon the whole Concavity of his belly *. And which by *Riolanus* was seen in a *Parisian* Woman, whose Spleen rested upon her Womb, and for two years deceiv'd the Physicians, who took it for a *Mole*; whereas when the dead body was open'd, the cause of the Swelling, and the Womans Death, were both found together to have proceeded from the Spleens being fall'n down out of its place.

* *Not many months ago I had a Child under my cure who had a Spleen so large, that it covered almost the whole* Abdomen, *and reached down to the left Groin: it was so apparent, that it might outwardly be felt, being above nine Inches in length, and about seven Inches in breadth. The Child died, and was opened; by which we were confirmed in the extravagancy of this Bowel.* Salmon.

The bigness.

V. *The bigness of the Spleen in Men is various, according to the diversity of Bodies and Constitutions. For generally it is six Inches long, three broad, and about the thickness of the Thumb.* In diseased bodies it sometimes grows to an enormous bigness; so that its protuberancy beyond the Ribs may be both felt and seen. They that inhabit moist Regions and Fenny Places, have large *Spleens*. *Lindan* reports also, That the Common People of *Friezland*, that use for their common Drink sowre *Butter-milk*, have great *Livers*. In the Year 1657. I dissected a body, wherein I found a four square hard *Spleen*, about the bigness of a mans head. *Fernelius* also writes that there was a Liver seen, that for bulk and quantity exceeded the Liver. *Wepfer* found a *Spleen* in the body of a Noble Woman, that in length exceeded five hands breadth, four in breadth, and one and a half in thickness, and weighed about six common pounds, and so exceeded the Liver in bigness. *Aetius l. 7. c. 10, 16.* writes, that in *Splenetic* Persons this Bowel sometimes reaches in length to the *Groins*, and with its breadth touches the Liver. Such great Spleens as these *Vesalius* also and *Marcellus Donatus* testifie that they have seen themselves. And *Cabrolius* makes mention of one that weigh'd five pounds. *Schenkius* also relates out of *Gamerus* the Story of one that weigh'd three and twenty pound. But such prodigious bulks are very unusual. In the mean time, the more preternaturally big this Bowel is, the worse it is with the Patient whose body is the more extenuated thereby, because it does not afford matter sufficient to accomplish convenient Fermentation in the Liver, of which the blood being destitute, cannot be attenuated and brought to perfection as it ought to be; but is left, sowre, acid, thick, and otherwise unprofitable for the Nourishment of the Parts. From whence arises the *Scurvy*, as *Hippocrates* first observ'd, *l. 2. Poreth. They*, saith he, *are troubled with bad Gums, and stinking Breaths, who have large Spleens: but they who having large Spleens are subject to bleed, and yet have no ill smell in their mouths, they are troubled with bad Ulcers and black Spots in their Legs.*

Lean people most subject to swoll'n Spleens.

VI. Spigelius *has observ'd, That they who have large Veins, have larger Spleens, and therefore lean People are more subject to swoll'n Spleens than they who are fat.*

Small Spleens.

VII. *Rarely the Spleen is less than its natural proportion, and yet I remember some Examples of such.* 1. Vidus Vidius *the younger*, L. 12. de Curat. Morb. c. 10. *in the Body of a Man very cachectic, found a Spleen no bigger than a Pigeons Egg, almost as hard as a Stone.* 2. Salmuth Cent. 2. Observ. 21. *in a Woman that dyed in Child-bed, otherwise very healthy while she lived, had found a Spleen so small, that it hardly exceeded the bigness of a Man's Thumb.* 3. *Riolanus* also reports that the Spleen of *Thuanus the Historian* hardly weigh'd an Ounce. 4. *Conringius* affirms, that hardly any footstep of a Spleen appeared in the *Princess* of *Luxemburgh.*

The Shape.

VIII. *The shape of it is oblong, like an Oxe's Tongue, whence some have call'd*

call'd it the Tongue-Bowel, *as being not unlike it in Oxen, Dogs, and many other Brutes: it is somewhat full of Crinkles within side; but the outside is somewhat bunchy or bossie. But in Man the shape of it is found to receive sundry Figures: as being in some triangular, in others gibbous, square, round, sharp pointed; and in others distinguish'd into Lobes.* The uppermost and thicker part of it is call'd by *Hippocrates* and *Ruffus* the *Head*, the thinner part the *Tail*.

Its Colour. IX. *The Colour in a Child in the Womb is ruddy; in Persons grown up to maturity of a lead Colour, or black and bluish. And* Spigelius *has observ'd it, and shewn it in dissection of grown Persons, when it has been as red as the Liver, which has been also observ'd by* Vesalius, Bauhinus, *and* Conringius. The cause of which variety of Colour proceeds from variety of Dyet, and alteration of Temper and Heat; for thereby is caus'd a great alteration of the Humors of the whole Body, and so of those Humours that are carried to the Spleen, whence the variety of Colour.

Membranes. X. *It is surrounded with a double Membrane; one exterior from the* Peritonæum; *the other thin and proper to it self, proceeding from the exterior Membranes of the Vessels entring the Spleen, and interwoven with a neat and wonderful contexture of Fibres.* Which Tunicles or Membranes have their Arteries, Veins, and Nerves from those that pass through the inner Substance.

Malpigius l. de Lien. c. 1. remarks a wonderful hardness of the inner Membrane, not yet observ'd by Us. *It is observ'd*, says he, *by many, that that Membrane becomes bony; and* Boschius *has seen it so hard toward the Muscles of the* Abdomen, *that he suspected some scyrhosity to be within it. And many times, especially in Sheep, I have observ'd little Stones of a Pargetty Substance, Ulcers call'd* Melicerides, *and other Tumours, proceeding perhaps from the various conglutinating matter breaking forth from the Extremities of the Vessels.* In the next Chapter he writes, that he himself once saw that Cartilaginous or Gristly Membrane in an Ox, and that the same was observ'd by *Spigelius*.

Various Lymphatic Vessels, form'd like a kind of Net. XI. *Between both Membranes shoot forth various Lymphatic Vessels, like a kind of a Net, furnish'd with several Valves, which according to the observation of* Malpigius, *contain a yellowish or somewhat reddish Liquor, but by my own, and the observation of others, a Limpid, and by conspicuous passages carried through the Cawle, cast forth into the Receptacle of the* Chylus. All which arise from many very small conglomerated Kernels contain'd in the Spleen.

It is furnish'd with Fibres. XII. *It is also furnish'd with innumerable Fibres thin and strong, compos'd of little Strings twisted together with a wonderful piece of Workmanship, without any hollowness in themselves.* *Glisson* indeed attributes something of hollowness to 'em, and misguided by that Error, that he thought they contributed to conveigh the Alimentary Juice to the Nerves. *Malpigius* altogether doubtful as to their Cavity, confesses he could not perceive it, and yet leaves it to more piercing and fortunate Inventions to determine the matter. Others, less accurate Inspectors, believ'd those *Fibres* to be a Contexture of the smallest Sanguiferous Vessels.

Its Vessels. XIII. *Besides the forementioned Lymphatic Vessels conspicuous among the Tunicles, it receives also other Vessels, as Arteries, Veins, and Nerves, dispers'd thorough its whole Body.*

Its Arteries. XIV. *It is watered with two Arteries, one entring the upper part, the other the lower part: which* Malpigius *observ'd to enter the* Parenchyma, *or Substance of the Spleen in an Ox and Sheep with one Branch, but in a Dog, a Horse, and several other Creatures, with three or four Branches. These Arteries are carried from the Branch of the left* Cœliaca, *which they call the Splenetick Artery, and sometimes from a certain Branch going forth from the Trunk of the* Aorta, *and with a winding Course proceeding to the Spleen by the side of the* Pancreas, *and being there divided into a thousand Branches, are dispers'd all over it.* Through these Arteries the Blood is forc'd, for which if there be not a passage sufficiently free, to the Roots of the Veins and the Splenetick

Branch,

Branch, so that it comes to boyl too much in the Spleen, there happens a Pulsation in the Spleen no less than that in the *Arteries*. Of which *Tulpius* relates a miraculous Story, *L.* 2. *Observ.* 28. of a Pulsation of the Liver that was heard at the distance of thirty foot.

Its Veins. XV. *It sends forth a great Vein from the flat part, call'd the* Splenetic Branch, *which sticks close to the* Parenchyma *with numberless Roots, out of which insensibly closing together, sometimes three, sometimes four or more greater Branches are found, by and by concurring altogether into that one Splenetick Branch which runs forth athwart under the Ventricle, through the upper parts of the Caul, to the* Vena Portæ, *and discharges it self into it.*

Highmore *denies the great number of the Veins.* XVI. Highmore *denies so many Veins, or that they run so far into the Bowel, and asserts the numerous Sanguiferous Vessels to be only little Branches of the Arteries dispers'd through the whole Bowel, and believes the Anatomists to be deceiv'd, as mistaking* Fibres *for* Veins. But this same Bowel, of so remarkable a bigness, in respect of its Function, cannot but have many blood-bearing Vessels of both sorts, which tho' they can hardly be demonstrated perfectly distinct, yet may they be comprehended by the Understanding. For if there be so many *Arteries* that pour blood into the *Bowel*, there must be also many *Veins* to assume that infus'd Blood, and to carry it into the *Splenetick Branch*; for otherwise there would be a *Restagnation* of the blood, and consequently a Tumor and Inflammation of the Bowel.

Its Valves. XVII. Highmore *hath also observ'd in the said Veins at the Exit out of the Spleen, certain little Valves looking forth from the Spleen, and so plac'd, as to suffer nothing to flow from the Splenetick Branch to the Spleen, but only the Humours from the Spleen into the Splenetick Branch.* Which Valves, tho' by reason of their extraordinary thinness, they can hardly be demonstrated, yet are they presently perceiv'd, so soon as the Splenetick Branch is puff't up, or that Water be injected into it through a Syringe; for then they hinder the breath and the water from penetrating into the Spleen.

Its Anastomoses. XVIII. Bauhinus, Bartholine, *and some others write, that in the inner part of the Bowel, several Branches of Arteries close together with the ends of the Veins by* Anastomoses, *by which means the Blood is transfus'd out of them into these; and so flow to the Splenetick Branch.* But this seems not so probable, seeing that the blood in such a Passage or Transfusion only cannot acquire a requisite subacid fermentative quality. And hence it is necessary, that that transfusion of the blood be made by some intereceding *Medium* (as happens in the Liver, of which we shall say more below, when we come to discourse of the Function of the *Spleen*. In the mean while one remarkable *Anastomosis* is to be observ'd (rarely two) by which the Trunk of the Artery, before it enters the Spleen, closes with the *Splenetick Branch*. Which seems to be form'd to that end, partly that the *Arterious Blood*, by its mixture, may render the Humours more fluid that are carried out of the Spleen to the Splenetic Branch, and excite 'em to more speedy motion. Partly, that the redundant and superfluous blood, which by reason of the narrowness of the Passages cannot pass with that requisite swiftness through the Spleen, may flow through this *Anastomosis* into the Splenetick Branch.

The Vas breve. XIX. *Now there is a Vessel call'd* Vas venosum breve, *which enters the Splenetick Branch, not far from, or rather just at its going forth, frequently in Man at the very Exit of the Branch out of the Spleen; in Beasts, a little farther off, the Roots of which Vessel sticking to the Ventricle, meet together about the bottom of it, seldom joyning into one, frequently into two or more Chanels, and so constitute sometimes one, sometimes two or three,* Vasa brevia, *which all shoot forth into the Splenetick Branch.* In Dogs and other brute Beasts, rarely one, frequent several *Vasa brevia*, descend into the said Splenetick Vessel.

Internal Hæmorrhoid Veins XX. *Sometimes a certain Vein ascending upwards from the inner part of the* Podex, *enters the Splenetick Branch at the lower part, and pours forth its blood into it. The Roots of which adhering to the inner part of the* Podex, *are call'd* Venæ Hæmorrhoidales internæ, *the Internal Hæmorrhoidal*

rhoidal Veins, of which nevertheless the Trunk is most frequently inserted into the left Mesenteric Vein. These Vessels, that is to say *Arteries* and *Veins*, before their Entrance, are covered with a double Tunicle; the outermost of which they put off when they enter, and cast next about the Spleen, and by that means the Tunicle of the Spleen is made out of it.

No Chylus goes to the Spleen.

XXI. *Besides the forementioned Vessels carrying manifest Humours, some there are who tell us of milkie Vessels. But it is most certain that no milkie Vessels shoot forth to the Spleen. For if the* Chylus *were carried thither, it would run the hazard of a Coagulation, by reason of the acidity of the Splenetick Liquor. And therefore they are also mistaken who think that part of the* Chylus *ascends from the* Vena Portæ, *through the Splenetic Branch to the Spleen, as was formerly asserted by the Ancients, and lately by* Ent, Apolog. Art. 23. *But through that Branch, as well the blood that remains out of the Nourishment of the Stomach, as that which is after a peculiar manner concocted in the Spleen is swiftly carried through the* Vena Portæ *and the Liver.* Which is most apparent in the Dissections of living Animals by a knot fasten'd upon that Branch. For presently a swelling will arise between the Ligature and the Spleen, and a lankness toward the *Vena Portæ*. Which Ligature, if it be ty'd in live Dogs, somewhat before the Entrance of the *Vas breve* into the Splenetick Branch, then the swelling will appear between the Spleen and the Ligature, and the lankness on the other side. Which is a certain sign, that none of the thinnest *Chylus*, which nevertheless *Regius* inculcates is carried from the Stomach to the Spleen through *Vas venosum breve*, or other *Gastric Vessels*, to be there alter'd into a *fermentaceous* matter; but that the venal blood only descends from the *Ventricle* through that Vessel, and flows directly through the Splenetick Branch to the *Vena Portæ*. Moreover if the said Ligature be ty'd upon the *Vas breve* it self, then are we taught another thing; for then presently the swelling appears between the Ligature and the Vessel, and the lankness toward the Splenetick Branch. By which it is plain, that the blood descends from the Veins of the Ventricle, as has been said, but that no Melancholy or Acid Juice ascends this way to the *Ventricle*, and is pour'd forth to create hunger, according to the Assertion of the Ancients. Lastly, if the short Vessel be open'd by Incision above the Ligature, and the Liquor flowing out be taken up in a Spoon, any man may see that it is only the pure *Venal Blood*, without any mixture of *Chylus*; and that it differs not a jot either in Substance or in Colour, from any other *Venal Blood*; and this whether you look upon it warm or cold. Which plainly overthrows the Opinion of those, who affirm part of the *Chylus* to be carried to the Spleen through those Passages. An Opinion which we have sufficiently refuted in the seventh Chapter above.

Its Nerves

XXII. *Besides the foresaid Vessels, the Spleen also receives two little Branches of* Nerves, *deriv'd from the Costal Branch of the sixth Pair, which do not only pass through the outward Tunicle, and not lose themselves there, as was formerly thought by many, but penetrating further inward, are distributed through the innermost parts of the Bowel, with a manifold Ramification, which little Branches accompany the Blood-bearing Vessels, and are enfolded in the same Covering with them, being form'd out of the proper Membrane that covers the Spleen, which at the entrance of the Vessels turning inward, and shap'd into the fashion of a Pipe, accompanies, and as it were gathers into a Bundle the Ramifications of the said Vessels.* *Glisson* also observes that these Nerves, the nearer they approach to the Spleen, the larger they grow; as they likewise do in a little space after they have enter'd the Spleen.

Whether they carry any Alimentary Liquor?

XXIII. *Moreover,* Glisson *writes, that the ends of these* Nerves *are united with* Nervous Fibres, *and by that means a certain Alimentary Liquor is infus'd out of the one into the other, and carried from these to the greater* Nerves (*which Alimentary Liquor, he says withal, is pour'd forth through the* Parenchyma *of the Spleen, being first extended by the* Fibres *themselves*) *afterwards this Liquor is conveigh'd into the Folding of the* Nerves *adjoyning to the Renal Glandules, from thence, as occasion shall*

ſerve, to be diſtributed into all the Nerves *of the Body, either immediately through the* Nerves *of the ſixth Pair, or by the means of the Brain and Spinal Marrow; and ſo to be carried to all parts of the Body. But the moſt learned Perſon is in this particular altogether out of the way.* For, as has been ſaid, the *Fibres* are not hollow, nor have the Nerves ſufficient Cavities through which any Liquor prepared in the Spleen can paſs: nor was ever any *Anatomiſt* ſo quick-ſighted as to ſee any Liquor in the Nerves, or that after Diſſection could ſqueez the leaſt drop out of 'em. Beſides, it is unqueſtionable, and no more than what is receiv'd and eſtabliſh'd by all Philoſophers, that the Animal Spirits are thruſt forward through the Inviſible Pores of the Nerves from the Brain and oblong Marrow into all the parts of the Body: Now then, ſhall any other viſible Alimentary Liquor, thicker than the Spirits, aſcend from the Spleen to the Brain, or its Marrow through the ſame Inviſible Pores by any other Chanel or Stream? Will the Nerves receive the Alimentary Juice from the Spleen into themſelves, not only to be caſt forth into other parts, but alſo to be remitted back into the Spleen it ſelf? Shall at another time the ſmalleſt drop of Liquor falling upon the Nerves beget a Palſie, and ſhall this entring in abundance out of the Spleen produce no harm? Theſe are very great Abſurdities, and therefore an Opinion ſupported by ſuch ſlender Props muſt fall of Neceſſity. See more of this *L.* 8. *c.* 1.

Wherefore the Spleen is not ſo quick of Feeling.

XXIV. *Here ſome one perhaps may put the Queſtion how it comes to paſs, that the Spleen furniſh'd with ſo many little Branches of Nerves ſhould be ſo dull of Feeling, ſeeing that the Nerves are not only endued with a moſt quick Senſe, but alſo contribute to all the membranous Parts by the animal Spirits a moſt acute Feeling?* The reaſon of this is, becauſe there is a continual Numneſs upon thoſe Nerves occaſioned by the ſubacid Subſtance of the Spleen, which is perceived in the Taſt of the Spleen being boyl'd, and Sowre withal, as alſo by *acid fermentative Juice* which is bred therein, encompaſſing the Nerves. As the chewing of acid and ſowre things begets a Numneſs in the Teeth, ſo that their Senſe of Feeling is much leſs, or at leaſt more obtuſe than at another time.

And thus much concerning the Veſſels, whoſe State and Condition, how they were found out by accurate Inſpection into the Spleen of an Ox, *Malpigius* deſcribes *l. de lien. c.* 3.

The Subſtance.

XXV. *After the Fibres and the Veſſels, the Subſtance it ſelf of the Spleen is to be enquired into; which in a ſound Spleen is ſomewhat hard and firm; and endures handling without any harm; but in a ſickly Condition of Health grows ſofter and is eaſily diſſolv'd.* Thus in *Scorbutic* and *Hypochondriacal* Perſons I have often found it ſo ſoft upon Diſſection, that with the leaſt Touch the Finger would enter into it: And the external Air would eaſily diſſolve it; tho' outwardly at firſt ſight there was nothing to be diſcovered amiſs either in Bigneſs or Colour. I diſſected a *Scorbutic* Thief that was hang'd in *March* 1651. The Subſtance of whoſe Spleen was very ſoft; yet neither exceeding due Proportion nor ill Colour; and at that time, being cold Weather, within two days, it was diſſolved by the external Air into a frothy Liquor of an obſcure red Colour, ſo that unleſs it were ſeveral Fibres and thin Veſſels, there was nothing ſolid appeared within its Membrane. From whence appears the Miſtake of many, who in the *Scurvy* and *Hypochondriacal* Diſtemper, *Quartan Agues*, and other Diſeaſes ariſing from the Spleen, always lay the Fault upon the Obſtruction, Hardneſs, and Tumor of this Bowel, when for the moſt part there is nevertheleſs no ſuch Fault in it to be found in thoſe that dye of thoſe Diſtempers, and only ſome ſpecific Dyſcraſis or peculiar Diſpoſition of the Part receding from its natural Sanity, are the cauſe of theſe Diſtempers; while that peculiar Indiſpoſition begets ſome Matter either too Acid or too Sharp, too weak or too fix'd, or ſome other way out of Order. Yet we do not deny but that in a preternatural State, ſometimes it becomes ſo brawny and hard, that it may be felt without ſide of the Body. Nay *George Queccius*, a Phyſician of *Norimberg* and *Schenckius*, have ſeen Spleens that have been cruſted in the Middle with a *Cartilaginous Subſtance.*

Whether it be like the Subſtance of the Liver.

XXVI. *Many have affirm'd that this Subſtance is like the Subſtance of the* Liver, *and that this Bowel performs the ſame Office with it, and that when that Bowel is out of Order, this*

this Bowel alone does its Duty. But the Dissimilitude of each Part is sufficiently apparent both from the Colour and the Taste. For the *Colour*, which in a raw Liver is Ruddy and altogether Sanguine, in the Spleen is Black and Blue, or of a leaden Colour. And that which in a boyl'd or roasted Liver is somewhat Yellowish, in a roasted Spleen is like the Dreggs of red Wine. Then the Taste of a boyl'd Liver is between *bitterish and sweetish*; the Taste of a boyl'd Spleen is somewhat *acid and sowrish*.

Whether it be bloody.

XXVII. *It is commonly held, that the Substance of the Spleen is a certain Mass of clotted Blood, supporting the Vessels that run through it; because it is easily made fluid by a slight Attrition. But* Malpigius, *utterly destroys this Opinion, who having accurately searched into the Mysteries of this Bowel with his Microscopes, writes that the whole Body of the Spleen is a membranous Mass distinguished into little Cells and Apartments, and not so thick a Body as it has been formerly describ'd to be, but loose and thin.* And to this Knowledg he attain'd by a particular Experiment: That is by blowing up the Spleen through the Splenetic Artery and Branch, till it was very much swollen, and drying it swell'd as it was; for so, he says, it may be plainly seen, that the whole Mass of the Spleen consists of Membranous *Ends* or *Cells* like the *Cells* of *Hony-combs*. And as for the Original of these Cells, and their wonderful Structure, he elegantly and at large describes it in his Book *de Liene*, where it is to be read.

Little Glandules in the Spleen.

XXVIII. *The same* Malpigius *was the first that observed in the Substance of the Spleen several little Glandules worthy Observation:* Of which he thus writes. *In the Spleen*, says he, *are to be observ'd several numerous Clusters of little Glandules, or rather little Bladders or Baggs dispersed through the whole Spleen, that resemble a Cluster of Grapes exactly. The least of these Glandules are of an Oval Figure, and in bigness little differ from the Glandules of the Kidneys. Their Colour as I have always observ'd, is White; and altho' the* Vasa Sanguinea *of the Spleen by the pouring in of Ink swell and play about 'em, these preserve the same Colour. Their Substance seems to be Membranous, but soft and subject to crumble. Their Hollowness by reason of their extraordinary Smallness, is not perceptible to the Eye, and only to be apprehended by Conjecture; while being slit they seem to fall one into another. They are very numerous and almost innumerable, and are wonderfully placed in the forementioned Cells of the whole Spleen, where vulgarly its Parenchyma is said to be. Also from the Slips there hang little Boxes, or else from the Fibres that arise from it: And besides the ends of the Arteries like young Vine Shoots, or crawling Ivy creep about 'em, which is to be observ'd in a fresh Spleen, the Arteries being blacken'd. They hang for the most part in Clusters, every Cluster containing seven or eight. Yet they do not so easily appear in the Spleen of every Creature. Nay in the Spleen of an Ox, a Sheep, or a Goat, they are only to be discovered upon Laceration of the Bowel; or by a slight shaving with a Penkife, and long washing with fair Water. They are not so easily discrib'd in a Man. But if by the occasion of any Disease the whole Body of the Glandules swell, they appear more manifest, being enlarg'd in Bigness, as I observ'd in a Girl that dy'd, whose Spleen was full of little Globes dispersed in Clusters.* More than this in the same place he tells ye his Opinion of the Use of Glandules, and what separation of Humors is made therein in a Discourse at large.

Certainly we are much indebted to this quicksighted *Malpigius*, who by his Microscopes, has so clearly dispell'd the thick Clouds that hung over the Knowledg of the *Spleen*, to the end the use of it, which was doubtful before, may be the better understood.

Unusual things found in the Spleen.

XXIX. *Sometimes unusual things have been found in the Spleen*, Vesalius l. 19. de Corp. fab. c. 9. *writes that he found in the Spleen of a certain Person, small enough, but of an extraordinary Hardness, Fat growing to the gibbous or hunchy Part, compacted together like a hard white Stone.* *Schenkius, Observ. l.* 3. relates that there was found in the Body of a *Spoletan* Lord a Spleen without any Juice or Pulp at all, empty like a Purse, and fix'd to the left Ribs. *Turneiserus in Exam. Urin.* writes that he found a Stone in the Spleen of a certain noble Woman, of the Bigness of a Chestnut, soft as Alabaster, weighing two Ounces and five Drams, consisting as it were

of thin places wrapt one within another like Eggshels. In like manner *Fallopius* has observed Stones to be bred in the Spleen. In the Year 1667. in *January*, we dissected a Woman in the presence of several Spectators, whose Spleen was exact, as to its Proportion, and for heat and hardness well enough; but in the fore-part, where it looks toward the Stomach, we observ'd a white Substance much different from the Substance of the Bowel, hard and firm, and which would scarce give way to the crushing of the Fingers, about the bigness of a Goose Egg, not growing without-side to the Bowel, nor swelling outward from it, but plainly and truly continuous with it, and being a part of it, tho' nothing like the other Particles of the Bowel; neither could it be called Fat or a Glandule, from whose Service it differ'd altogether.

The Temper of the Spleen.

XXX. *Concerning the Temper of the Spleen, some question whether it be to be call'd a hot or a cold* Part? *To which I answer that it ought to be call'd a cold* Part. *Not that it is really cold, but less hot than the Heart, Liver, and many other Bowels*; and besides, because it refrigerates the arterious Blood that flows into it, and makes it subacid; and fixes and dulls its sulphury hot Particles, and deprives 'em of all their Volatilitie.

The Action.

XXXI. *Concerning the Action of the Spleen, various are the Opinions of the Learned.*

Erasistratus, and *Ruffus* the *Ephesian* will allow it no Office or Function. *Aristotle* affirms it to be necessary by Accident, like the Excrements of the Belly and Bladder. *Hippocrates* calls the Spleen a Fountain of Water. And hence perhaps *Wharton* affirms that it sucks forth a watry Liquor out of the Blood, but to what end cannot be discovered, unless it be for the Nourishment of the Nerves: Which Opinion we have sufficiently refuted; to which he adds several other things of little Moment concerning the use of the Spleen.

Whether it separate Melancholy from the Chylus.

XXXII. *Many according to the Opinion of* Galen *and the Ancients, believed the Office of it to be, to separate the feculent or melancholy part of the* Chylus, *and to attract it through the splenetic Branch, and to collect it into its self (as the Gall-bladder receives the yellow Choler) and to concoct it somwhat, than to empty it again partly through the* Vas Breve *into the Stomach to excite Hunger, and partly through the splenetic Branch into the Intestins, and through the Hæmorrhoidal Vein to the* Podex. *Which Opinion* Bauhinus, Riolan, *and* Bartholine, *have refuted by many and almost the same Reasons; tho' there were little need of so many, when these three are sufficient to destroy it.* 1. Because there is no such large Hollowness in the Spleen, where such Excrement should be stor'd up. 2. Because there is no way through which it may be commodiously evacuated, since it neither ought nor can pass and repass through the same Splenetic Branch. 3. Because if in a living Animal you tye a Knot upon the Splenetic Vein, the *Vas venosum breve*, and the *Hæmorrhoidal Vein*, it demonstrates the contrary, as we have already shown, which Demonstration alone is sufficient to destroy that fond Opinion.

Whether it make Blood.

XXXIII. Vesalius, Plater, Charles Piso, Bauhin, Spigelius, Jessenus, *and many others, affirm'd the Spleen to be a sanguifying Bowel, no less than the* Liver, *and call'd it, as* Aristotle *does*, Hepar Vicarium, *the* Deputy-Liver: *believing when the Liver was distempered, that this Bowel did execute its Office. Chiefly enduc'd by this Argument, because the Spleen in the* Birth *is of a ruddy Colour, just like the Liver, and for that the Spleen being deprav'd, Sanguification is annoy'd.* Then they thought, that that same Blood which was made in the Spleen serv'd for the Nourishment of Bowels contain'd in the *Abdomen*, as the Liver-blood serves for the Nourishment of the rest of the Parts. Which splenetick Blood they affirm'd was made of the watry feculent *Chylus*, which some believe to be carried thither through the *Milkie Vessels*, others *from the Stomach* through the *Vas Breve*, and others, that it was attracted by the Spleen through the Splenetic Branch. But this Opinion by many things already said, is most plainly overturned: Seeing the Work of Sanguification is not accomplished either by the Liver or the Spleen, but only by the Heart: there being no Vessels that proceed from the Liver through which any Blood can conveniently flow to the Nourishment of the Parts seated in the *Abdo-*

Abdomen: Neither are there any Paſſages that convey the *Chylus* to the Spleen, as being a Part to which no *Milkie Veſſels* run: Neither is any thing carried through the *Vas venoſum breve* from the Stomach; ſeeing that the ſaid *Vas breve* is not inſerted into the Spleen, but into the Splenetic Branch without the Spleen; nor can any Attraction be made of the Splenetic Branch toward the Spleen, as is before prov'd. *Veſlingius* therefore obſerving this Difficulty of the Acceſs of the *Chylus*, flyes to the Inviſible Pores of the *Ventricle*; through which he ſays, there is a watry *Chylus* conveighed to the Spleen; but proves it by no Reaſons. Laſtly this Opinion is totally refuted by the circular Motion of the Blood, by which it is apparent that no Blood is carried to the Parts from the Liver or Spleen through the Veins for the Ends of Nutrition; nor can be carried by any manner of Means by reaſon of the obſtructing Valves; but that the Boold is all transfuted from the Heart through the Arteries to all the Parts.

Whether it prepare blood for the heart.

XXXIV. Emilius Pariſanus, Subtil. l. 6. Exercit. 2. c. 3. *following the Opinion of* Ulmus, *believes that the Spleen prepares Arterious Blood out of the beſt part of the* Chylus *for the left Ventricle of the Heart; which Blood is carried through the Arteries into the* Aorta, *and thence into the left Ventricle of the Heart. Which Fiction* Ent *deſervedly derides and explodes*, Apolog. Artic. 23. *Galen* alſo writes, that ſome of the Scholars of *Eraſiſtratus* believ'd that the whole *Chylus* was carried to the Spleen, by which it was made into a *courſer ſort of Blood* for the *Liver*. But both theſe Opinions are ſo abſurd, that if we only conſider the Paſſages and Motion of the Blood, they want no farther Refutation.

Whether it attract the acid part of the blood.

XXXV. Walæus *obſerving that there was no motion of the Humours through the Splenetick Branch to the Spleen, nor that any milkie Veſſels reach'd thither, concluded rightly, that the matter concocted in the Spleen is Arterial Blood infus'd into it through the* Cœliaca. Only in this he fail'd, that he thought the Spleen attracted to it ſelf the acid part of the blood, and not the reſt, as if the Spleen being endu'd with judgment and taſte, was more pleas'd with the acid than the ſweet part, and not only could diſtinguiſh, but knew how to ſeparate the one from the other. Moreover, he conſider'd not, that in Arterial Blood there are no Particles actually acid, but that acid Particles are generated in the Spleen out of the ſalteſt Particles of it; which being mix'd with the Venal Blood, ſerve inſtead of a Ferment, whoſe ſlighteſt acidity concocted in a ſpecific manner in the Liver with the ſulphurous Particles, changes it into a biliary Ferment, which by that Effervescency that is made in the Heart, periſhes again and vaniſhes.

Whether it nouriſh the Nerves.

XXXVI. Gliſſon *aſſerts that the chief Action of the Spleen is to make Alimentary Liquor for the Nouriſhment of the Nerves, which Opinion we rejected when we diſcours'd of the Nerves of the Spleen.*

Whether the ſeat of the Soul.

XXXVII. *As for* Helmont's *Opinion, who places the ſeat of the ſenſitive Soul in the Spleen, it is not worth a Refutation.*

An Experiment of Malpigius

XXXVIII. *The moſt accurate and induſtrious* Malpigius, *being very much diſſatisfied concerning the Action and Uſe of the Spleen, to the end he might be able to aſſert ſomething more certain than others had done, reſolv'd to try an ingenious Experiment, hoping thereby to diſcover ſome light in this obſcure darkneſs.*

In a young Dog (ſays he) *having made a wound in the left* Hypochondrium, *the bloody Veſſels of the Spleen burſting forth at the gates of the Spleen, were ty'd with a ſtring, then thruſting back what was coming forth into their places, the* Peritonæum *and Muſcles being ſow'd up together, and the skin looſly united, in a few days time the wound was cur'd. In a weeks time the Dog recover'd, and ran about as he us'd to do, ſo that as long as he liv'd there was no ſign obſerv'd that any harm had been done him, or of the hurt of his health: But becoming more hungry, he greedily devour'd his Meat, and eat Bones or any thing of that nature; and his Excrement obſerv'd the exact courſe of Nature. One thing only I obſerv'd, that the Dog piſs't frequently, and very much; which though it be cuſtomary to other Dogs, yet this ſeem'd to exceed the common cuſtome. The habit of body every way healthy and fat; and in nimbleneſs and briskneſs equal to others of his kind. But this was peculiar in the external habit of his body, a ſwelling of the right* Hypochondrium, *ſo that the extream Ribs burgeon'd out beyond the reſt. Thereupon, freſh hopes*

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encouraging, a second Dissection is design'd. The Spleen then in the slit Abdomen *whose Vessels were fast ty'd, appear'd very slender, so that being wrapt with the Caul, there hardly remain'd any footstep of it behind. For it resembled a small bag interwoven with Membranes: the Blood-Vessels numerously dispers'd to the Stomach, and through the Caul, were entire and flourishing, and full of blood. The Splenetic Branch open, and natural, surrounded with its natural fat. The Liver to sight, as to substance, colour, and shootings forth of the Branches, all in good order: only you might have said it exceeded a little in bigness, in regard it spread it self largely over the left* Hypochondrium. *Neither was there any thing found amiss in the Breast or the* Abdomen, *or the fleshy part: the blood brisk, ruddy, and fluid. All these things being found in a Dog, gave us not the least light to find out the use of the Liver.*

Certainly it is a wonder that nothing could be learnt or found out concerning the Use of the Spleen: Nevertheless I put down this, that I might excite others to make the like Experiments; that so at length the true use of the Spleen may come not only to be taught by Reason, but to be shewn and prov'd by Demonstration.

The true Action of the Spleen.

XXXIX. ***From what has been said, it is abundantly apparent how various and uncertain the Opinions of most Doctors are concerning the Use of the Spleen, so that hardly any one has hit upon the true use of it; which is no other, than to make acid matter out of the Arterial Blood, out of which being again mix'd with the sulphurous Particles in the Liver, and concocted after a specific manner, the bilious Ferment of the Blood and* Chylus *is made.*** But how that acid Matter or Juice is generated within it, is not so easie to be explain'd. That Operation seems to proceed in this manner. In the Substance of the Liver, which is acid by nature, are contain'd many Glandules; now the blood is pour'd into those small Glandules through the ends of the *Arteries*; and into that the Animal Spirits are infus'd through the ends of the *Nerves*, concluding in those Glandules, which taming the sulphurous spirit of the blood, give it a slight Acrimony; with which being once endu'd by the compression of the adjoyning parts, it is squeez'd out of the said Glandules, and swallowed up by the Roots of the *Splenetick Vein*; and so flows through the *Splenetick Vein* through the *Porta* and *Liver*. But before it runs under the Roots of the Veins, it seems to stay in the adjacent Cells, whose Substance is acid, and by that stay acquires in them a more eager acidity, as Wine standing in a Vinegar Vessel, acquires a more acid Acrimony.

Whether a man may live with his Spleen cut out.

XL. ***Here arises a Question, Whether the Spleen be a Vessel necessary to Life; and whether it may be taken and cut out of a Man's Body, and the wound heal'd again without any damage of Life or Health?*** For the Affirmative part the Authority of *Pliny* offers it self, who *L.* 11. *c.* 37. thus writes, *It is certain that the Bird call'd* Ægocephalus *has no Spleen, nor any of those Creatures that want blood.* It is many times a peculiar impediment, and therefore they that are troubled with it, have it burnt out; and Creatures are said to live after it is taken out by Incision. *Trallian* seems to prove *Plinies* Opinion by a Practical Example, who *L.* 8. relates that a Soldier was once cur'd by him, the whole region of whose Spleen had been burnt with barbarous hot Iron-Tools. *Bartholine* also *Cent.* 4. *Anat. Rar. Hist.* 51. endeavours to confirm the Authority of *Pliny*, by the Experience of *Fierovantus*, boasting that he had cut the Spleen out of a certain Woman, and so restor'd her to health; of which he writes there is no question to be made, because of the Witnesses, whereas he produces no Witnesses of any credit. This Experiment of *Fierovantus*, *Deusingius* both quotes and admires, and out of *Francis Rousset*, brings the Testimonies of two inconsiderable obscure Surgeons, who affirm'd that they had taken out Spleens that were alter'd and wounded, and had heal'd the Patients with success; and giving undoubted credit to these Testimonials, he concludes concerning the Spleen; *This Bowel is not necessary for Life, but only for a more happy Constitution of Health; not so much to being, as to well-being; not to Nutrition and Preservation simply, but to a better Nutrition, as the generation of a thinner, more elaborate, and more spiritous Blood.* To the Confirmation of which Opinion, the foregoing Experiment of *Malpigius* very much conduces, taken out of the same Author. And that same new way, lately first invented in *England*, of cutting the Spleen out of Dogs that live for all that, seems very much to favour this Opinion. As we also, with several others, have seen a whole Spleen taken, or cut out of a Dog, the *Abdomen* of the left side being slit by

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Regner de Graeff, and the Veſſels of the Spleen well ty'd with a ſtrong Thred: afterwards the wound being cur'd, the Dog was recover'd, for which reaſon we call'd the Dog *Spleenleſs*. At the ſame time the ſame accurate Diſſecter *R. de Graeff*, told us, That the Engliſh gave him an account, how that thoſe Dogs after their Spleens were taken out, were afterwards always barren: and that therefore he reſolv'd to try the Experiment in a Bitch, which he kept after he had cut out the Spleen and cur'd the wound: but this Bitch growing proud was lin'd by a Dog, and whelp'd two Puppies, by which he refuted the obſervation of the Engliſh. All theſe things ſeem to ſhew that there is no great neceſſity of this Bowel for Life, nor ſo noble a uſe as hitherto has been attributed to it.

The *Negative* is maintain'd, not only by the Ancients, but alſo by *Levinus Lemnius*, *Toby Knoblock*, *Lindan*, and innumerable other *Neoteric* Phyſicians; nay, of ſix thouſand you ſhall hardly find one that does not altogether explode the former Opinion. Of which *Calius Aurelianus* thus writes; *That the Spleen may be cut or taken away, we have heard indeed related in words, but never actually perform'd.* Reaſon alſo and Experience ſupport the ſame Negative.

The former Opinion refuted by Reaſon.

XLI. Reaſon: *For that the chief Architect never made any thing in our Bodies in vain, and therefore all the Bowels, none excepted, and all the parts are found and given to ſome neceſſary Uſe.* What man then in his Senſes can believe, that ſo eminent and large a Bowel as the Spleen is, and with which all Creatures that have blood, except ſome few, are endu'd, ſhould be given in vain to Men and Beaſts, without any neceſſity for Human Life. Of whoſe true Function and Uſe, altho' we in theſe darkneſſes of Nature, may not perhaps ſo rightly judge, and raiſe ſharp Diſputes upon this Subject, yet this does not take away the Uſe of the Bowel it ſelf for the ſupport of Life, ſeeing that not only its remarkable bigneſs, and admirable connexion and ſociety with other Bowels, ſufficiently ſhew, but alſo Health proceeding from its ſoundneſs, and ſeveral Diſeaſes ariſing from its deprav'd Conſtitution, daily teach us the Neceſſity of it.

By Experience.

XLII. Experience: *For that never, that I know of, it was ever ſeen, heard, written or obſerv'd by any Phyſician of any Credit or Authority, that ever any man had his Spleen cut out and liv'd.* The Story of *Trallian* proves nothing; for he does not ſay that his Patients Spleen was cut out, or conſum'd and waſted by Uſtion; but only that the exterior Region of the Spleen was cauteriz'd. As for *Fierovantus*, he was a ſtrowling Mountebank, of no Authority, and very little Credit, who endeavour'd to impoſe upon ſilly People, that he might appear a greater Phyſician among the Vulgar than he was. As for thoſe obſcure Chirurgeons cited out of *Rouſſettus*, there is the ſame Credit to be given to them. And we remember a thouſand other ſuch like little Fables rela.ed to us, by certain ignorant and vainglorious Surgeons, to whom there was no Credit to be given. Certainly, if the thing were really ſo, we ſhould not need in this Age to fetch Teſtimonials from Mountebanks and ſtupid Barber Chirurgeons, ſince we have had ſo many thouſand eminent and famous Phyſicians and Philoſophers, who have made it their buſineſs to dive into the Myſteries of Nature, of whom, tho' not all, yet ſome would have ſeen and obſerv'd ſomething concerning this matter. But now the whole Confirmation reſts upon the uncertain Teſtimonies of ſome obſcure Authors, which are contradicted by other more ponderous Reaſons, beſides the former alledged; ſo that the ſaid Opinion can no longer be propt by any more ſuch weak Supporters: For that beſides the Nerves, large Blood-bearing Veſſels enter the Spleen of a Man, and go forth again; two Splenetick Arteries and various Veins meeting in one Splenetick Branch, of which the ſole reſection is ſufficient, to kill a man with a vaſt Flux of blood. For it is not probable that theſe Veſſels can be ſo ſtraitly bound by any Knots, or other aſtringent Remedies, but that the Flux of blood muſt be very great for all that. Or if they be bound with Strings (which in that hidden part of Man cannot conveniently be done, as is known to them that underſtand the Conſtitution and Connexion of the Bowel) yet then not long after, the Threads being putrify'd, either a deadly Flux of blood or a Gangrene, muſt of neceſſity follow. Moreover, I my ſelf have more than once ſeen Spleens wounded with Swords and Spears, but never knew any man ſo wounded eſcape, notwithſtanding all the diligence that I and other Surgeons could uſe. Now if only the wounds, and

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those slight ones too, of this Bowel are Mortal; nay, if only its being out of order, its obstruction, or any other Distemper so grievously disturb the whole body, and many times occasion death; how much more deadly will it be, how much more destructive to the body and to life, when it is all taken away? As for Dogs, whose Spleens are cut out, they do not all live; nay, of many so serv'd, very few recover; and they, the rest of their lives, dull, heavy and slothful, nor do they live long. And that for this reason without doubt; for that for want of convenient matter to be afforded from the Spleen, convenient Ferment cannot be prepar'd in the Liver, which causes a thicker blood to be generated in the Heart, out of which blood but few Animal and Vital Spirits can be rais'd, and those very thick. Besides, what may be done safely and conveniently in a Dog, to attempt that in Man, to the hazard of Life, would be a Villany. For that which in this particular proves not mortal in a Dog, would certainly kill a Man. Without doubt, there is no Person of sound Judgment but must suffer himself to be perswaded, but that this Bowel executes a more necessary Action in Man, than in a Dog, in whom the *Pancreas*, or other part, may better supply the office of the Spleen, than in a Man, as in whom the whole Bowel is furnish'd with so many Arteries, Veins, and Nerves, and furnish'd with its own *Parenchyma*, and consequently cannot be created in vain.

The Spleen not of so great Use in a Dog as in a Man.

XLIII. *Hence it is apparent what is to be answer'd to that Experiment of* Malpigius, *that is to say, that because there is a lesser use of a Spleen, and not so necessary an action requir'd from it in a Dog as in a Man: hence it happens that some Dogs may want the use of it, and yet not all; Experience teaching us, that several have perish'd in a short time, whose Spleens have been cut out, and few have escap'd.* Whereas it is otherwise in Man, in whom seeing the least disorder of the Spleen many ways, and after a wonderful manner disturbs the whole *Microcosmical Kingdom*, much more dammage would it receive from the taking it out of the Body.

It is a most necessary Bowel for Life.

XLIV. *And therefore we must conclude the Spleen to be in man most necessary for Life, and that it cannot be cut out, and the life of man be still preserv'd.*

CHAP. XVII.

Of the Function of the Liver *and Spleen; also of the use of Choler, the Pancreatick and Lymphatick Juice.*

A Digression.

I. *HOW various the Opinions of several Men have been concerning the use of Choler, the Pancreatic Juice, and the Lympha, we have shewn in the foregoing Chapters.* But since no Body has as yet perceiv'd, or at least describ'd the Dignity of those Bowels, nor the necessity of those Juices, it will be now time that those Mysteries that have lain hid for so many Ages, should be brought to light, from the knowledge whereof will arise the greatest light to Physic, and the obscure and unknown Causes of many Diseases will be discover'd.

The Actions of the three Bowels.

II. *The Actions of the Liver, the Spleen, and the Sweet-bread all conspire to the self same end, and prepare the Ferment of the Blood and* Chylus *together, in the making whereof the Functions of these three must of necessity concur, when the one cannot perfect this business without the other.*

As Leaven is mix'd with Flowre of Wheat kneaded with warm Water, that thereby the more thick and earthy Parts of the Wheat may be dissolv'd, and the spirituous Parts asleep and lying hid in that terrestrial Mass may be attenuated and stirr'd up, and so the whole Mass of Bread being throughly besprinkl'd with those attenuated Spirits is made more light and easy for Digestion: Thus there is a necessity for the Ferment to be mix'd with the *Chylus* and Venal Blood, by means of which the spirituous Particles lying hid therein, may be attenuated and quicken'd up, and so the whole Mass be more fit for Sanguification and Nourishment.

The Ferment of Bread, what and how it operates.

III. *Now that same* Leaven *of Bread, which will bring us more easily to the Knowledg of the Ferment of the Blood and* Chylus, *is generally*

rally made of some Quantity of Meal which is kneaded together with warm Water, to which is added a small Quantity of Salt & Vinegar, and so kept in a warm Place, till the salt or acid Spirits are somewhat volatiliz'd by the Heat, and pierce through the Particles of the Mass of Flower, and dilate and separate 'em, and so render the whole Mass Subacid and Fermentative. Then a little Piece of this acid Ferment being mix'd into the Mass of Meal kneaded with warm Water, causes the whole Mass to ferment. For those Fermentaceous Particles diffuse themselves through the whole Mass, and cut and attenuate all the Parts of the Dough, and the Spirits therein lying hid. Our Country Folks mix also Yest with their Dough to the same end; and others perhaps may use another Ferment; but all Ferment, whatever it be, consists of Salt, Acid, Sowre, and Corroding things, melted and somewhat volatiliz'd with a moderate Heat: Which if they be thicker and closer, are more slowly dissolv'd, and their Power shews it self more slowly, and must be mix'd a longer time with the Dough before they can ferment it, as happens in the first Ferment, which must be mix'd for many Hours, and sometimes a whole Night, to perfect its Work. But if by the Mixture of certain sulphury Particles they become Spirituous and more Volatiliz'd, they ferment presently as we find in Yest, which within an Hour, or half an Hour, and sometimes sooner, accomplishes its Operation. For the more spirituous sharp Particles be in this more free from the Matter wherein they are lodged, and for that Reason are indued with a more penetrating Power, operate more suddainly, and in a short time dissolve the thick Particles of the Dough, and more swiftly rouse the latent Spirits, which they do yet more violently, if a little Honey be added to the Yest: For the Honey contains in it self sharp Particles, but lately dissolv'd by the Sulphury, and involv'd within 'em. But nothing of this is perform'd without a moderate Heat, as being that by which the salt Particles must be brought to a moderate acid Quality, and something of Volatility.

Note this well, viz. *that Honey helps the Ferment.*

Chyle and Blood fermented in the same manner.

IV. *In the same manner it is with the* Chylus *and Venal Blood, which if they be not attenuated and prepared by the Mixture of convenient Ferment before Sanguification, then they fail to be full of spirits in the heart.* That is to say, the Spirits lying asleep therein, are not sufficiently separated from the more thick and serous Matter, but lye drowsie still, which produces thick and watery blood, of little use to nourish the Body and strengthen the Parts; whence the Body becomes languid, and both Natural and Animal Actions go but slowly forward.

The Liver causes the Ferment.

V. *This Ferment of the Blood and* Chylus *is made by the Liver, with which Hepatic Ferment however, the Pancreatic Juice is mixt in the* Duodenum, *for the more special preparation of the* Chylus *flowing out of the Stomach.*

The matter of the Ferment.

VI. *The matter out of which the Liver makes this Ferment, is the Venal Blood flowing into it from the Gastric and Mesaraics through the* Vena Portæ, *and a small quantity through the small Branches of the* Epatic Artery, *with which is mix'd a sowre, salt, acid Juice, made in the Spleen of the Arterial Blood flowing into it through the Arteries, and the Animal Spirits through the Nerves, which is carried through the Splenetic Branch to the* Vena Portæ, *and together with the Blood with which it is mixed is conveighed to the* Liver.

Preparation of the Ferment.

VII. *And by means of this sharp and corroding Juice, by the specific power of the Liver, the spiritous Particles, as well the sulphury as salt, latent in that Venal Blood, are dissolv'd, attenuated, and also made somewhat sharp and fermentative, and some certain thinnest part of 'em, like fair and clear water, by means of the conglomerated Glandules seated chiefly in the hollow part of the Liver, separating it self from the remaining thicker part of the Blood through many Lymphatic Vessels, is carried from the Liver into several Veins, to prepare the Venal Blood flowing toward the Heart.* But the greatest part of it is carried to the *Vasa Chylifera*, in them to prepare the *Chylus* for succeeding Fermentation in the Heart. To which end also a certain fermentative *Spittle*, as also a salt and somewhat acid *Lympha* is also carried thither from the Glandules of the Armholes, Groyns, and other Glandules, and somewhat of the thinner *Pancreatic*

Juice out of the Inteſtines, together with the *Chylus*, enters the *Vaſa Chylifera*.

Yeſt, or the Ferment of Beer.

VIII. *But as in Ale that works, many ſpirits already rais'd, are already mingled with the whole quantity of Ale, and render it ſpiritous, ſtrong, and fit to be attenuated and digeſted in the Stomachs of thoſe that drink it: So alſo many ſpirits being ſtill intermix'd and coop'd up within the more thick and viſcous* Particles *of the Ale, aſcend with them to the top, and boyling, or rather fermenting and frothy, burſt forth out of the Veſſel with a noiſe.* Which frothy Subſtance has a kind of bitteriſh ſharp, intermix'd with ſomething of a ſweetiſh taſte. And this is that which our Houſwives call *Yeſt*, and we the *Flower of Ale*, which being preſerv'd, ſerv'd to ferment new Ale, or new Dough.

Generation of Choler.

IX. *Thus the Operation alſo proceeds in the Liver, and the more ſharp fermentative ſpirits, being mix'd with the thicker and more viſcous ſulphury Juices, (for Sulphur is clammy) and ſtrongly boyling or fermenting, when by reaſon of the viſcoſity of the Juices wherein they are lodg'd, they cannot enter the conglomerated Glandules, and from thence the Lymphatic Veſſels, and yet by reaſon of their ſharp Ebullition they are parted, together with the Juice wherein they are lodg'd, become bitter, and are call'd by the name of* Choler. Which *Choler*, by the means of the Glandulous Balls, flows by degrees to the Inteſtines thorough the *bilary Porus* and the *Gall-bladder*, to the end that there, together with the *Pancreatic Juice*, it may be mixed with the thicker Maſs; that is to ſay, with the Nouriſhment concocted in the Stomach, and now deſcending to the Inteſtines, that it may alſo cauſe that to boyl, and by that means diſſolve and ſeparate the thinner parts of the *Chylus* from the thicker, and attenuate to that degree, that they may be forc'd into the narrow Orifices of the Milkie Veſſels.

Choler ſlides down the Ductus Cholidochus *into the* Jejunum.

X. *To that purpoſe this Choler ſlides down through the* Ductus Cholidochus *to the beginning of the Inteſtines, that is, the* Duodenum, *and is there preſently mix'd with the* Pancreatic Juice *flowing thither through the* Wirtzungian *Chanel, from the Sweetbread, and by that means is by and by mingled with the Alimentary Maſs concocted in the Stomach, and deſcending from it, and cauſes it to boyl.*

Why the Jejunum *is empty.*

XI. *And becauſe at the beginning it is ſharper, and retains its full vigour, and for that by reaſon of the mixture of the Pancreatic acid Juice, it is preſently ready for Ebullition; hence in that very beginning, the Effervеſcency is moſt intenſe; which is the reaſon that the Milkie Juice, lodg'd in the Maſs, concocted in the Stomach, is for the moſt part immediately ſeparated in the* Jejunum, *and through the innumerable Milkie Veſſel belonging to this Gut more than to any other, with an extraordinary ſpeed puſh'd forward to the Receptacle of the* Chylus, *for which reaſon that Gut is for the moſt part found empty and faſting.* But in the next Guts, by reaſon of the moſt thin fermentative Spirits diſſipated at the beginning, the Effervеſcency is ſomewhat ſlower and leſs effectual, and the ſeparation of the *Chylus* from the thicker Maſs that remains is more tardy, which is the reaſon they have fewer Milkie Veſſels. Laſtly, The remainder of that fermentaceous Matter being mix'd in the thick Inteſtines, with the thick dregs of the Nouriſhment, being now ſlowly diſſolv'd, by reaſon the more ſubtil parts and ſtrength of it are waſted by a long Effervеſcency in the thin Guts, cauſes a more ſlow and leſs frequent (and that not without a longer ſtay) fermentative Effervеſcency in them, which moving and diſtending the feculent filth, and rendring it more ſharp, moleſts the Guts, and ſo provokes 'em to evacuation. And now becauſe this Effervеſcency happens to be late, therefore thoſe Provocations are not frequent, ſo that men in health ſeldom go to ſtool above once or twice in a day. And as that remaining Ferment is more or leſs acrimonious, hence it cauſes in the Excrement a ſwifter or later, a more intenſe or remiſs Effervеſcency, whence more frequent or more ſeldom going to the Stool.

How the Choler becomes more ſharp.

XII. *But how it comes to paſs that the ſaid Choler becomes more ſharp and fermentative in man, proceeds from hence, that all the milder Choler does not preſently flow directly from the Liver through the bilary Porus into the*

the Inteſtines, but a good part of it, and that the thinneſt is carried from the Liver through the gaully Roots into the Gall-Bladder, and there ſtays a while, that by the ſpecific Property and Temper of the Place, the more ſharp Spirits, through that Stay, may be the more vigorouſly rouſed up and exalted, and thence, boyling a little in the *Cyſtis*, may flow to the Inteſtines: Into which Place being brought, and being either too little, or too ſharp, it may there be the cauſe of Diſeaſes of both kinds.

The farther Progreſs of the Fermentation.

XIII. *But the ſuperfluous and chiefeſt part of the Venal Blood, of which the Ferment is made in the Liver, which neither could nor ought to be chang'd into the Nature of Choler or Lympha, being plentifully furniſh'd with the fermentative Quality of the made Ferment, flows into the* Vena Cava, *with which from above out of the ſubclavial Veins, it meets a prepar'd and attenuated* Chylus, *or in the abſence of that the* Lymphatic Liquor *alone, mix'd with the Blood of the* Subclavial *Veins, and ſo by degrees enter the right Ventricle of the Heart, and there by reaſon of that previous convenient Preparation, or attenuation, are preſently dilated into a Blood-like ſpirituous Vapor; as Gunpowder preſently flaſhes into a Flame when touch'd by Fire.* Now that the Blood flowing out of the Liver into the *Vena Cava*, is mix'd and endu'd with a Fermentative, and chiefly Choleric Quality appears from hence, that if in a Creature newly kill'd the Liver be cut from the *Vena cava*, and the Blood flowing out of it ſav'd, put but a little Spirit of Niter to that Blood, and preſently it becomes of a Ruſt-Colour, which happens in no other Blood, and by that means the *Bilious Ferment* concealed within it, is diſcover'd.

The Circulation of the Blood.

XIV. *But that that ſame bloody Spirit may be more perfect, and retain its Vigor the longer, by the beating of the Heart it is forced immediately through the Pulmonary Artery into the* Lungs, *and there by the Cold of the Aire breath'd in is condenſed into Liquor, and flows through the Pulmonary Vein into the left Ventricle of the Heart, wherein again (as Spirit of Wine is rectifi'd by a ſecond Diſtillation) it attains the utmoſt Perfection of ſpirituous Blood, and ſo is forc'd into the* Aorta, *that thereby it may be communicated thro' the leſſer Arteries, and through all the Parts of the Body, to nouriſh and enliven 'em. Out of which Nouriſhment, that Blood which at length remains, being depriv'd of the greateſt part of its Spirits, enters the leſſer Veins, and by thoſe is carried to the greater, and by them again to the Heart, to the end it may be there again attenuated and become Spirituous.* But becauſe in that Circulation, many parts of the Blood are conſum'd in the Nouriſhment of the Parts, whoſe Subſtance alſo is continually conſum'd and diſſipated by the Heat; hence it is neceſſary that a new *Chylus* fit to be changed into Blood be again mix'd with the venal Blood returning to the Heart; to ſupply the place of what is waſted: And thus our Life conſiſts in ſuch a continual Nouriſhment, which failing, preſently Health is impair'd, and the Oyl of our Lamp being waſted we goe quite out.

The Original of Ferment.

XV. *It may be queſtioned whence thoſe ſharp hot fermentative Qualities ariſe in our Nature. I anſwer, out of Sulphur and Salt. The firſt Emotion is from Sulphur, but the primary Acrimony is from Salt, which beſides Sulphur is lodg'd in all Nouriſhment. For there is nothing which we eat that does not naturally contain a Salt in it, tho' ſome things contain more, ſome leſs: and Sulphur diſſolves the Salt, and renders it fluid. Which being diſſolv'd and attenuated, corrodes, penetrates and diſſolves by means of its Acrimony, all the Particles of the Nouriſhment, and ſo diſpoſes 'em for the Extraction of the Spirits that ly hid within 'em.* Which Operation is Fermentation, without which Man could not live; and with which being weak or deprav'd, a Man lives miſerably. Now to advance this Fermentation the more proſperouſly, by inſtinct of Nature to the natural Salt which is in our Nouriſhment we add the help of Sea Salt, which we mix with our Meat, and with which we powder our Fleſh: And ſo much the harder the Subſtance of the Meat is, and conſequently the more violent Fermentation,

and effective Ferment they require for Digestion, so much the more we desire to have 'em well salted; as Beef and Pork. For that the Salt in such Meats causes a more easy Digestion. So that the sulphury Spirits that are to reduce that Salt to Fusion, are sufficiently redundant and effectual in Man, as in young and choleric People. And of this we have a manifest Example in a Herring, which being salted and eaten raw easily digests in the Stomach, but not being salted, tho' boyl'd, is with great Difficulty digested. Moreover that the Fermenting Spirits lying hid in that thick Salt may be roused up to Action, we boyle our Meat in the Kitchin, that the more fix'd and solid Parts of it may be the better dissolv'd, and so prepared to Fusion and Volatilitie, that they may be the more easily tam'd and vanquish'd in the Stomach, when we feed upon those harder sorts of Food, we make use of sharp spirituous and sulphury Sawces, as Spice, Turneps, Anise, Carrots, Mustard; many times drink strong Wine, and Spirit of Wine after Meals. For the sulphury Spirits being mixed with the Salt, potently dissolve and penetrate the thick and fixed Particles, and a fitness to melt, and so advance the *Energie of Fermentation.* Which chylifying Operation is very much assisted partly by the Spittle which flows from the Mouth to the Stomach and is endued with a *fermentative Quality*; partly by a peculiar Ferment, which is made out of some part of the *Chylus*, remaining after its Concoction and Expulsion of the greatest part to the Intestines, in the Stomach, and sticking to the Folds and Pores of the innermost Tunicle, and there turning sowre. And so by that first Fermentation the more spirituous and profitable Parts of the Nourishment come forth of the thicker Mass like Cream, and assume the Name of *Chylus.*

Blood is made of the Chylus *in the Heart.*

XVI. *Out of this* Chylus *endu'd with many salt and sulphury Particles from the Nourishment received by means of a new fermentative Preparation, caused by the Choler, Pancreatic Juice, and Lympha, the Blood is made in the Heart, which contains in it self those salt Particles of the* Chylus, *but more attenuated and mix'd more exactly with the Sulphureous.*

Another Ferment in the Spleen.

XVII. *Out of the salt Particles of this Blood, flowing to the Spleen, the splenic Artery, and to the Sweetbread, and many other Glandules through peculiar Arteries, and somewhat separated by the Affinx of Animal Spirits, there is another matter of Ferment to be composed in the Spleen and Parts aforesaid,* to be the greatest part concocted into a more perfect Ferment by the Liver for the Venal Blood and *Chylus.*

Ferment brought by degrees to be subtile.

XVIII. *And thus the first Original of Internal Ferment is from the Nourishment, which afterwards is more and more attenuated by various Concoctions, and alter'd in our Body into a more subtle Ferment.*

The true Office of the Liver, Spleen, and Pancreas *to make Ferment.*

XIX. *Now that it is the true Office of the Liver, Spleen, and Sweetbread, to make Ferment in the manner aforesaid, is apparent from hence, that when those Bowels are perfectly Sound, and perform their Duty according to Nature, the whole Mass of Blood is better and more full of Spirits, and thence the Body more Lively and Active, and all the Natural and Animal Operations are rightly perform'd.* On the other side, when these Bowels are out of Order, a thousand Diseases arise from the Blood and *Chylus* ill fermented.

How the Spleen makes sharp Juice.

XX. *As we have already said there is a sharp Salt, acid Juice which is made in the Liver out of the artery Blood, copiously forc'd through the splenic Artery into this Bowel, which by the plentiful pouring in of Animal Spirits through the Nerves, and by the specific Temper of this Bowel is soon altered, and the sulphury Spirit that was before predominant in it is dull'd, fix'd, and suffocated, so the salt acid latent Spirits comes forth into Action, and the salt Particles, somewhat separated from the Sulphury, get the upper hand: And hence it comes to pass, that the hot sweetish Blood flows through the Arteries into the Spleen, but by and by the sulphury Heat being extinguish'd, together with the Sweetness, it becomes Saltish, or somewhat Acid, and flows through the Splenic Branch from the Spleen to the Liver: Which is the Reason a boyl'd Spleen tasts somewhat Sowrish.* And thus it happens in this Matter,

Matter, as in a Vinegar Vessel, Vinegar is made out of Wine; for the Vinegar Vessel is laid in a warm Place, commonly in the Garret, where the Sun may come at it. Into this Vessel, not quite full, they pour a moderate Quantity of good strong Wine (for weak Wine will not make good Vinegar.) Which done, presently the sulphury sweet Spirit of the Wine is fix'd and suffocated by the salt and acid Particles predominating in the Vinegar, and the salt and acid Particles which are lodg'd in the Wine are melted, dissolv'd, attenuated, and forc'd to Action by the sharp Acidity of the Vinegar, and so the Wine turns Eager, and becomes Vinegar. And thus the sulphureous Spirit of the Arterial Blood, is fix'd and stifl'd, partly by the Animal Spirits flowing through the Nerves, partly by the acid and salt Spirits prepared and contain'd in the Spleen; and the salt and acid Spirits that are in it get the upper hand; which afterwards, new sulphury Spirits that ly in the Venal Blood, being mix'd therewith afresh, are to be by the Liver altered into perfect Ferment.

The first Matter of the Ferment prepared in the Spleen.

XXI. *Now that the first Matter of the Ferment to be perfected in the Liver is prepared in the Spleen, may be in some measure demonstrated by Experience.* For if the Spleen of an Ox, Hog, or other Male Creature be cut into small Bits, and macerated in luke-warm Water, and afterwards mixed with a small Quantity of Dough, it dilates it, and causes it to ferment, like Yest or any other Leven: Which it does so much the more effectually if the smallest Quantity of Vinegar be added to it.

The rise of Diseases from the Spleen.

XXII. *Now if this Function of the Spleen be interrupted, there are two Causes of Diseases which arise from thence. Some by reason of the salt and acid Juice too thick and fix'd: Others when it is too thin and volatile.* For when the salt and acid Juices in the Spleen are not sufficiently dissolv'd and attenuated, then the Spirits which are extracted out of them are too sharp, corroding, and in too great Abundance, and this Diversity produces Diversity of Diseases.

In a weak Spleen the acid Juice is not enough concocted.

XXIII. *If the Spleen be weak, either through its own or the Fault of the Nourishment, or through any other Cause, then the acid Juice that is concocted in it, is not sufficiently dissolv'd, attenuated, and volatiliz'd, but remains thick, and tartarous, or earthy, and the greatest Part of it lyes heap'd together in the Bladdery Substance of the Spleen, and adjoyning Parts, by reason of its crude Viscosity, which causes the Spleen to wax great, and to swell, in regard the Spirit that lies hid within it is not sufficiently rous'd up, but boyling a little in the narrow Passages in the Spleen and about the Spleen, distends the whole Spleen and Parts adjoyning to it, and raises a thousand windy Vapours with rumbling and roaring, and a troublesome Distemper familiar to Hypochondriacks.* Which Mischiefs are very much encreased by a deprav'd Condition of the *Pancreas*; proceeding from the Blood corrupted by the vitious Humors of the Spleen, and brought to it through the Arteries. By reason whereof it concocts its own Juice but ill; and of over Salt, leaves it too Acid or Austere, which partly begets great Obstructions in the *Pancreas*, the Disturbers of the Function of that Bowel: Partly flowing into the Intestines, causes an undue Effervescency therein, and infuses a bad subacid Quality into the *Chylus*; whereby it becomes lyable to fixation, or coagulation; nor cannot be sufficiently attenuated. Whence by reason of the more fixed and thicker *Chylus* remaining in the *Abdomen*, and less prepared to farther Solution, are generated Obstructions in the milkie Vessels, in the *Mesentery*, and *Glandules* of the *Mesentery*, and therein a great Quantity of crude and ill Humors is heaped together, from the Quantity and Corruption of which a thousand Diseases arise, which are vulgarly called Melancholic, and are said to arise from the Spleen, but how they are bred by it, has not been as yet sufficiently Explain'd. But when the Blood remains too thick for want of effectual and convenient Ferment, and Spirits not supply'd in sufficient Quantity, the whole Body grows dull and languid, and many Diseases arise. For the Blood being thick and not sufficiently Spirituous, and having salt crude and slimy Parts intermix'd with it, by coagulating the Humors in the Liver and other Bowels of the *Abdomen*, it breeds Obstructions and Scirrhosities. It is not sufficiently dilated in the Heart, but is forc'd too thick into

into the Lungs; and there being yet more refrigerated by the Air drawn in, it difficultly passes through the narrow Passages of 'em, and so stuffing the Lungs, and compressing the Gristles of the Windpipe, causes difficulty of Breathing. In the Heart it self by reason of the inequality of the Particles, and the difficult Dilatation of many, it produces an unequal, and sometimes an intermitting Pulse. In the Brain passing difficultly and disorderly through those narrow Channels, it causes Noises and Heaviness of the Head; and because it endammages the natural Constitution of the Brain, and because it tears it with its remaining Acrimony, the principal Animal Actions are thereby impaired, the Imagination and Judgment are deprav'd, the Memory is spoyl'd, and thence Madness, and Restlesness, Watching, and such like Inconveniencies arise which cause true Melancholy. But if that thicker Salt be somewhat more exalted and fluid, and yet is not sufficiently Spirituous, then the Blood requires an acid and austere Disposition, as in the Scurvy; and then the nervous Parts are torn and rack'd by it, the thin Skins invelloping the Bones are pain'd, and the softer Parts are corroded, the Guts also are terribly grip'd, and Ulcers arise in the Thighs very hard to be cured: Moreover the Blood becomes unfit for Nutrition, and thence a slow *Atrophie* of the whole Body. The aforesaid salt Particles being coagulated in colder Kidneys and separated from the serous Humor, harden into Stones; but being separated in the Joynts and fixed to the sensitive Parts, and corroding 'em, they cause the sharp Pains of the Gout: And lastly, heap'd together in greater Quantity, they breed knotty Bunches and Corns. All which things happen if the fermentaceous Juice in the Spleen be too raw and thick.

The said Ferment too thin & full of Spirits causes other Diseases.

XXIV. *But if the same Juice be too thin and full of Spirits, and be prepared too sharp, then other Diseases arise.* It excites in the Blood a great Heat conjoyned with some Acrimony, which because of the quick and disorderly Motion of the Animal Spirits causes Restlesness, Watchings, high Deliriums, and Madness. Sticking lightly, coagulated in the Guts, it breeds the running Gout, for that sharp Humor being by reason of its Tenuity easily dissipated in one Part, presently the Pain arises again in another Part, to which some other Particles of the same Blood happen to adhere.

The Spleen vitiated begets many Evils.

XXV. *The Spleen Scirrhous, or Obstructed, or any other manner of way vitiated by breeding a bad fermentaceous Juice, begets a thousand grievous Mischiefs.*

All which things sufficiently make manifest the Office and Duty of the Spleen.

The Functions of the Liver are apparent from the Diseases that proceed from it.

XXVI. *And in like manner, the Function of the Liver is apparent, from the Diseases that proceed from it when the Liver is colder than ordinary, it is not able duly to digest the said Splenetic Juice, and together with the Venal Blood, and the sulphury Juice intermix'd and sticking to it, to alter the splenetic Juice into a due Ferment: Whereby there can never be a due Fermentation.* The *Chylus* is not sufficiently concocted, nor sufficiently prepared for future Fermentation in the Heart. The venal Blood becomes Crude, Serous, neither does it get Spirits sufficient in the Heart, but is attenuated only into a watry Vapour, which turns to a watry Liquor in the Vessels and soft Parts, and so filling the whole Body with *Serum*, begets the Dropsy call'd *Anasarca*, attended with continual Drought, by reason of the salt Particles lodg'd in the *Serum* not well mix'd with the Blood, which together with the Juices flowing from the Salival Vessels, and at that time also saltish, being carried to the Chaps and Gullet, by reason of their dry Vellication, or twitching of the Part, occasion continual Drought.

Diseases arising from the Spleen.

The cause of Anasarca.

XXVII. *But when the Liver is hot, and consequently weak, then by exalting the sulphury and oily Spirits out of the Blood, it raises 'em in too great a Quantity; by which the Force of the acid Juice coming from the Spleen is very much weakened, and a bad Ferment generated. which produces Inflammations, Corruption, Fevers, and other hot Diseases arising from an over deprav'd Fermentation, and begets over much Choler.* Which Choler if it grow milder by reason of the Mixture of a little acid Juice, then it breeds the *yellow Jaundice*. But if sharp by reason of much Salt or acid and sharp splenetic Juice concocted with it, then it occasions the Disease *Cholera*, *Diarrhœa Dysentery*, and other like Diseases.

XXVIII.

The Liver Scirrhous. XXVIII. *The Liver obstructed and scirrhous not causing the Generation and due distribution of good Ferment, is also the Cause of several Crudities and many Diseases arising from Crudities.*

As for the fermentaceous Quality of the *Pancreatic* Juice, and what Diseases arise from a deprav'd Sweetbread, has already been discoursed C. 10.

Ferment in the Birth. XXIX. *In the Birth, while it is in the Womb, there is no need of any such Ferment at the Beginning, because it is nourished by the Dissolution and Fusion of the Seed, which contains in it self a Spirit moderately Fermentaceous; and then by the milkie Juice contained in the* Amnion *that needs less Ferment.* Afterwards when it requires somewhat stronger Nourishment, brought through the umbilical Vein, and begins to enjoy it, then the whole *Uterine Placenta* supplies the Office of the Spleen and Liver, and makes a more mild Ferment, more proper for the Birth in the Beginning. In the mean time the Liver and Spleen increase their Ferment to future Uses, that is, to prepare a more sharp Ferment afterwards, that is, when the Child being born should feed upon more solid Nourishment. Which Duty however those Bowels do not perform presently after the Birth of the Child, as it were by way of a Leap, but were also by degrees accustomed to it in the Womb. For the more the Heat of the Heart increases, and Blood is generated more full of Spirits, and the more the Brain is brought to Perfection and becomes stronger, the more sharp Spirits are generated in the Womb. And out of these two things, Blood and Animal Spirits meeting every day stronger and stronger in the Spleen, which by Degrees is brought to greater Perfection together with the Spleen, and preparation of the fermentaceous Matter begins to be made; and as for the manner of preparing the same Matter, the said Bowels have gain'd to a sufficient Perfection; as appears by the Choler, which you shall find well concocted in the Gall-bladder of a newborn Infant.

Conclusion. XXX. *And thus I think I have set forth the true, and never as yet sufficiently demonstrated Duty of the Liver and Spleen: As also the Use of Choler,* Pancreatic *Juice and* Lympha. Many more things might be alledged for farther Proof, but to the Learned what has been said may suffice.

The impartial Reader may confer these things with the Opinions of other Doctors that have wrote before us; and then he will perceive how far they have err'd from the Mark.

The Confederacy between the Liver and Spleen. XXXI. *And now from what has been said it is manifestly apparent what a necessary League and Confederacy there is between the Liver and the Spleen, and what and how many Diseases arise from the bad Constitution of either of these two Bowels.* How unlikely it is for a Man to live after his Spleen is cut out of his Body. It is also apparent how erroneously the second grand Concoction is said to be made in the Liver, Spleen, and Sweetbread, when of necessity it must be made in the Heart. For the forementioned Ferment is only made of the Blood, and the Blood must be first made in the Heart before it can come to the Liver, Spleen, and Sweetbread. And therefore the second general Concoction is made in the Heart, the third in the Liver, Spleen, and Sweetbread.

CHAP. XVIII.

Of the Serum *and Kidneys.*

Of the Serum and Reins. I. *Having thus explain'd the Office of the Liver and Spleen, it follows that we discourse of those Parts which evacuate the* Serum, *which is necessarily mix'd in great Quantity with the Blood, when it is too redundant.*

The Serum gives a necessary thinness & fluxibility to the Blood. II. *Now the* Serum *is a watery Part of the Meat and Drink, concocted together with the salt and sulphury Juices of the Nourishment, and plentifully mix'd with the Blood, to give perfect Mixture and necessary Thinness and Fluxibility, by means whereof it may penetrate the narrowest Passages; to wash away and mix with it the Impurities of the same and the more crude salt Particles, that together with it self they may be evacuated by Spittle, Sweat and Urine.*

III. *And*

Whether it be an Alimentary Juice.

III. *And here it is that the Opinion of* Jerome Barbatus, *and some others, is to be rejected, who endeavour by many Reasons to prove that the* Serum *is a Humour no less Alimentary than the Blood, and that it nourishes the Spermatic Vessels, as the blood nourishes the fleshy. But their Arguments are so weak, that it is not worth the while to refute 'em.* For tho' the Nourishment cannot be distributed to the Parts without the *Serum*, and that there are contain'd in it some salt and sulphurous Particles, nevertheless it cannot thence be concluded, that that same *Serum* nourishes the Spermatic Vessels, and that the Blood is excluded from that performance. But of this more at large *L.* 2. *c.* 12.

But for this *Serum*, because there is a necessity for an abundance of it to be mix'd with the blood, and to be daily renew'd, and yet it is not apply'd to any Substance of the Parts, therefore it is that Emunctories are requisite for the Evacuation of its too much redundant Superfluity.

The Emunctories twofold.

IV. *These Emunctories or Evacuatories, are twofold, External or Internal.*

The external Evacuatories.

V. *Again, the External are twofold: First, these, thorough which there is a manifest, but not perpetual Evacuation; as the Eyes, Mouth, and Nostrils.* From the Eyes fall the serous Humours of Tears. Through the Mouth and Nostrils the greatest part of the serous and flegmatic Humours and Vapours are expell'd, in Hawking, Spitting, Salivation, and the Murrh; as also in Respiration, which is conspicuous in the Winter. *Secondly*, Those Evacuatories through which there is made insensible Transpiration, that is to say, the Pores of the Skin, through which day and night there is a continual and insensible Exhalation of the serous Vapour, which is often perceived in the form of Sweat. Now this Evacuation of the serous Humour through the Pores, far exceeds all other sensible Evacuations of what Excrements soever. As for example; If a Man have taken in one day twelve pound of Nourishment, he shall evacuate through the Pores of the Skin, and by Transpiration near nine pound of Excrement in vapour, and hardly two by sensible Evacuation. Which *Sanctorius* taught us by an ingenious Experiment. He to that purpose weighed in a pair of exact Scales, a young Man in the Morning, after he had been at the House of Easment; and besides that, he weighed apart all the Meat which he was to eat that day. Then he as exactly pois'd the weight of his Spittle, Urine, and Stool, collected all together, and then weighed the same Person at the same hour fasting, as he did before. By which means he found that the Excrement insensibly evacuated through the Pores, exceeded far in weight all other sensible Evacuations.

The external Evacuatories of the Serum.

VI. *The Internal Evacuatories are the Reins and Piss-bladder, with the Parts thereupon depending.*

Whether any difference between the Serum, *Sweat and Urine.*

VII. *But before we begin with them, here is one Scruple to be remov'd; Whether the* Serum *and Sweat, under which ought to be comprehended Exhalations and Vapours, consist of the same Materials, and agree in Substance: Which is that which the generality of Physicians unanimously consent to.* Tho' *Ludovic Mercatus* differs from all the rest, as he that believes these four Humours to be distinct in Substance. But this Doubt may be easily resolv'd, by alledging that the *Serum* of it self is a meer watery Liquor; but that the Urine and Sweat are not Liquors so simple as the *Serum* so properly taken, but Liquors endued with a certain saltness, and concocted with salt Particles, differing little or nothing, in respect of Substance, one from the other, yet in the mean time their chiefest part is *Serum*, from whence the serous Humours, which are not erroneously for the most part call'd *Serum*, the word being taken at large, and the Denomination from the greater part of the Substance.

The Reins.

VIII. *The Reins are so call'd from* ῥέειν, *to flow, because the Urine, like so many Rivers, flows from them, and* νεφροὶ *from* νέφειν *to piss.*

Two in number.

IX. *They are in number two; seldom more or less: For it is look'd upon as a Prodigy, that there should be more than one Kidney upon one side, and none in the other, or two Kidneys upon one side; which nevertheless has been sometimes found to be true. Cabrolius* in two Bodies by him dissected, found one Kidney leaning upon the *Vertebers* of the Loyns.

Their place

X. *These two Kidneys are seated behind the Ventricle and the Guts, under the Liver and Spleen, on both sides near the* Spine, *at the head of the* Psoa Muscle. Whence it comes to pass that

that

that Muscle, being compress'd by the Stone in the Kidney, there happens a numbness in the Hip. However *Riolanus in Animadvers. in Bartholin.* alledges that that numbness proceeds from hence, that the Compression is made in that place, where those three Nerves are inserted into the musculous part of the *Psoa*, of which that remarkable Nerve is made in the Thigh, which is thence extended to the Foot: But in regard that Nerve in the Thigh is compos'd, not only of three, but of seven Nerves, that is to say, the four lower Nerves of the Loyns, and the three upper of the *Os Sacrum*, some of which abscond under the head of the *Psoa*. I do not see how the head of the *Psoa*, being compress'd, it should follow that the Nerves of the Thigh, seated in a lower place, should come to be compress'd, and that thence a numbness of the Thigh should follow.

The Situation. XI. *They lye upon the sides of the* Aorta *and* Vena Cava, *between the two Membranes of the* Peritonæum; *the right being placed a little lower than the left.* But the situation is very seldom alike; for either the right is somewhat higher than the left; nevertheless in Beasts the left is many times the lower.

The Bigness. XII. *They are both seldom of an equal bigness; for the most part the left being somewhat bigger than the right. They generally take up the length of three Vertebers, and sometimes four: three fingers broad, and equalling the thickness of the Thumb.* Sometimes the whole bulk is found to be lesser, and sometimes bigger, which *Bartholine* believes he has observ'd in those that were most prone to *Venery*. Sometimes the bigness increases to Monstrosity; such was that which we saw in the Carkass of a certain Person in the Year 1658. both whose Reins surpass'd the bigness of half a Man's head: For that Nature wonderfully sports her self in *bigness*, *number*, *figure*, and *vessels*. Of which there are various and remarkable Examples in *Eustachius*, *Fernelius*, *Vesalius*, *Carpus*, *Botallus*, *Bauhinus*, and others. Yet this Variety is very rare, and hardly to be found in one among six hundred.

The Figure. XIII. *In Figure they represent a French Bean, or the expanded Leaf of wild* Spikenard. *On the Outside they are gibbous, and bow'd backward: On the inside somewhat hollow at the ingress and egress of the Vessels.* The Superficies in a Man of ripe years is smooth and equal; otherwise in a Cow, Sheep, and many other brute Creatures, in whom it is unequal; as if the Kidneys were compos'd of many round fleshy little Lumps or Buttons. Which external shape they also shew in new-born Children, which remains for three years, and sometimes for six years after the Birth, as *Riolan* witnesses. *Eustachius* reports that he never observ'd that shape in Men grown up, but only twice. But *Dominic. de Marchettis* writes that he shew'd the same Figure twice or thrice in the Theatre at *Padua*. Once I remember I saw the same in a Man run thorough the middle of the *Abdomen* above each Kidney with a Sword: In whose body, when at the request of the Magistrate, I enquir'd into the Cause of his death, and the Nature of the wound, by chance I found such a Figure of the Kidneys, as if compos'd of small Buttons.

Their Membranes. XIV. *They are cloathed with two Membranes; of which the outermost is common, proceeding from the* Peritonæum, *call'd the* Fatty, *because that in fat people it is surrounded with a great quantity of fat. Into this the* Arteria Adiposa *runs, from the* Aorta: *out of it proceeds the* Vena Adiposa, *which the right Kidney sends to the Emulgent, rarely to the Trunk of the* Vena Cava; *the left sends forth to the* Vena Cava. *This Membrane knits both Reins to the Loyns and* Diaphragma; *the right also to the blind Gut, and sometimes to the Liver; the left to the Spleen and Colon. The innermost and proper Membrane is form'd out of the external Tunicle of the Vessels being dilated, (which Vessels enter the Kidney with one only Tunicle.)* Into which little Nerves are inserted, proceeding from the Fold of the sixth Pair, and the Thoracical Branch, affording a dull sense of feeling to the Kidney: which being nevertheless extended further into the *Ureters*, endue them with a most acute sense, and for that reason are the Cause that in *Nephritic* Pains the Stomach having a fellow feeling, has oftentimes a desire to vomit. But very few Nerves, and those very small, and hardly conspicuous, enter the Substance of the Kidneys it self.

The Vessels. XV. *Both the Kidneys have two large* Vasa sanguifera; *that is to say, an* Artery *and an* Emulgent Vein; *among which are sprinkled certain small*

Lymphatic Veſſels, *as ſome imagine.*

The Emulgent Artery.

XVI. *The Emulgent Artery, produced from the Trunk of the deſcending* Aorta, *being firſt doubled, enters the flat part of the Kidney; thence it is diſpers'd through the Subſtance of it with divers Branches, and therein vaniſhes into extream ſmall and inviſible Twigs.* Through this Artery, which is very large, great ſtore of blood is carried to the Kidney, partly to nouriſh it, together with its Urinary Veſſels; partly that a good part of the ſerous Humor may be ſeparated from it in its Glandules, and that being emptied through the little Urinary Fibres, and Papillary Caruncles, or the ten little Bodies in the Reins, into the *Pelvis*, or *Receptacle* of the Reins, the blood may become leſs *ſerous.* This Artery we have once ſeen in the right Kidney, inſerted into the lowermoſt part of the Kidney.

The Emulgent Vein.

XVII. *The Emulgent Vein is a little larger than the Artery. This, with innumerable Roots meeting together in this Trunk, adheres to the Kidney and its Glandules, and thence proceeding out of it from the flat part, runs on to the* Vena Cava, *into which it opens with a broad Orifice, ſo ſituated as to give a free paſſage for the Blood into the* Vena Cava; *but hindring it from flowing out of the* Vena Cava *into the Emulgent.* Whence it is certain, that the Blood is forc'd into the Kidney by the *Emulgent Artery* only, and part of it remaining after the Nouriſhment of the Kidney, being freed from a good quantity of the ſerous Humour in the little Glandules, flows through the *Emulgent Vein* into the *Vena Cava.* I think it was never obſerv'd that two *Emulgent Veins* proceeded out of one Kidney; yet once it was ſeen, and publickly demonſtrated by us in a diſſected Body, in *Novemb.* 1668. Both were of the uſual largeneſs; and one proceeded from the middlemoſt flat part of the Kidney, after the wonted manner; the other from the lowermoſt part of the ſame right Kidney, and about the breadth of half a Thumb one below the other, was inſerted into the *Vena Cava.* And ſomething like this I find to be obſerved by *Saltzman in Obſerv. Anat.*

The left Emulgent Vein higher and longer than the right.

XVIII. *The left of theſe Emulgent Veins in a Man enters the* Vena Cava *ſomewhat in a higher place, and is longer than the right, by reaſon of the higher and remoter ſituation of the Kidney from the* Vena Cava. In many Beaſts the right is the higher. Sometimes their number is unequal, and their Progreſs unequal, as ſhall be ſhewn more at large *L. 7. c. 6.*

The diſperſing of the Veſſels through the Kidneys.

XIX. *The diſſemination and diſperſing of both the Emulgent Veſſels through the Kidney, cannot be exactly demonſtrated, becauſe of the extream ſlenderneſs of the Branches, and the dimneſs of the Sight.* In the mean while ſeveral Anatomiſts have written various Speculations concerning this matter, according to the diverſity of their Opinions. Among the reſt, *Rolfinch* aſſerts that the Roots of the *Emulgent Veins* meet together with the ends of the *Emulgent Arteries* by *Anaſtomoſes*, and that he reports to be firſt obſerv'd by *Euſtachius*, *L. de Ren.* But *Malpigius* lately has ſufficiently demonſtrated the vanity of theſe Conjunctions, who by his Microſcopes obſerv'd that ſeveral ends of little Arteries end in very ſmall Glandules, adhering to the little Urinary Fibres or Veſſels; and that ſo ſome part of the *Serum* is ſeparated from the Blood of thoſe ſmall Arteries, and carried by the Urinary Veſſels to the *Pelvis*, or Receptacle of the Kidneys: but that the reſt of that Blood is ſuck'd up by the ends of the Veins, and ſo flows to the *Emulgent Vein*, and thence to the *Vena Cava.*

The Pelvis.

XX. *In the inner part of the Kidney is contain'd the* Pelvis *or* Infundibulum, *which is nothing elſe but a membranous Concavity, compos'd of the* Ureter, *expanded and dilated in the hollow of the Kidney, and reaching thither with open and broad Branches, ſometimes eight or ten, like Pipes:*

The Papillary Caruncles.

XXI. *Over which lye little pieces of Fleſh or* Caruncul*æ, vulgarly call'd* Papillares, *by* Rondeletius, Mammillares, (*over each one*) *like ſmall Kernels, not ſo deep coloured, but harder than the reſt of the Fleſh, about the bigneſs of a Pea, ſomewhat broader above, convex below, with holes bor'd through, but ſo ſmall that will hardly admit a hair.* *Malpigius* obſerv'd over and above, that innumerable Fibres alſo extend themſelves toward the gibbous part from the Appendixes of the *Pelvis* form'd into a Bow; and that ſome portions of the *Pelvis*, like extend-

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ed Vessels, accompanying the *Vasa Sanguifera*, extend themselves toward the Circumference.

The Substance of the Reins.

XXII. *The Substance of the Reins, as far as occurs to the sight, appears to be as it were fibrous, form'd out of the concourse and intermixture of the smallest Vessels joyned together, together with something of Carnosity intervening, endu'd with various slender little Chanels.* To the outward touch somewhat hard, but within side indifferently spungy; without of a dark ruddy colour, but toward the *Pelvis* or *Kidney Receptacle*, more pale.

The Superficies smooth in Men, rough in Children.

XXIII. This is as much as generally is obvious to the sight in the Reins. But not very long ago *Malpigius* was the first who discover'd more Secrets in the Reins, which were unknown to the preceding Anatomists; and because all Anatomists are upon this score much beholding to that great Man: of necessity the Mysteries by him revealed are here to be added. Neither is any thing to be detracted from the Honour of this first Discoverer.

The Discoveries of Malpigius

He writes *L. de Ren.* that tho' in Men grown up the Superficies of the Kidneys appears generally smooth, yet that in Children new born it is unequal (as has been already said,) and that that same Conjunction of the Buttons or Balls in grown People is still to be discern'd on the inside from the diversity of the Colour, which in the little Balls without, and toward the sides to which they are conjoyn'd, is ruddy, toward the inner parts is more pale. But as in Beasts those little Glandules are round, but toward the inner parts, being extended to an obtuse narrowness, are joyned together sometimes *quadrangular*, *quinquangular*, and sometimes *sexangular*; so likewise in Men there is plainly to be observ'd from the diversity of the Colour, the like, but a closer Conjunction of the little Balls. Then he adds, That the Membrane being taken away in a new, and as yet soft Kidney, certain round and very short Bodies roll'd up like Worms, may be discern'd by the help of a Microscope; not unlike those that are found in the Substance of the Kidney when cut asunder in the middle; and that this Connexion of Vermicular Vessels composing the external Superficies of the Kidneys, is the same with the Vessels descending to the *Renal Receptacle*. And that by the same Microscope are to be observ'd wonderful Branches of the Vessels lying hid under the outward Superficies; with little Glandules appendant, and dispers'd through the Superficies of the Kidney toward the *Renal Receptacle*: as also certain continu'd winding spaces and little Concavities running through the whole outward Superficies of the Kidneys, conspicuous by the pouring in a little Ink through the *Emulgent Vessels*: as also innumerable little Chanels, which resemble, as seems to the Eye, a sort of *Fibres* or Liver-like Flesh, but are really membranous and hollow, and by their being crowded together, constitute the Substance of the Reins, and are the Vessels that discharge the *Urine*. Moreover, he says, That the Membrane of the Kidney being taken away, and an Injection of Spirit of Wine dy'd of a black Colour, being made into the Emulgent Artery, innumerable small Kernels are to be observ'd, annexed here and there to double forked Arteries, and dy'd of a black Colour by the said Injection; as also several others between the bundles of the Urinary Vessels, and the Spaces intervening, which little Kernels hang as it were like Apples upon the *Vasa Sanguifera*, swelling with the black Injection, and spread into the form of a fair Tree. From these Kernels, where the ends of the Arteries lose themselves, he believes it also profitable that the Orifices of Veins arise, and that the smallest Nerves are produc'd from hence, and that the discharging Vessels are extended so far from the Ureter, seeing this is always the property of the Glandules, that the several Berries or Buttons produce their proper discharging Branch, besides the Veins and Arteries, as is done in the Liver, according to what we have said. He has also observ'd that those little Chanels or small Urinary Fibres being very many in number, lose themselves in every one of the *Papillary Caruncles* seated in the *Renal Receptacle*, and through those sweat through the Urine into the Receptacle; which Piss descends into the *Papillary Caruncles*, not thorough any of the little Pores of the *Pelvis*, as was formerly thought, but through these Chanels only, and out of them into the *Renal Receptacle*. And as for those *Papillary Tunicles* (of which some are round, others flat or oblong) he believes 'em to be nothing else but the Concourse of many small Chanels united together. He adds, That he certainly knows by diligent and frequently repeated Dissection, that in the Kidney of a Man, the Urinary Vessels that resemble solid and compacted *fleshy Fibres*, and yet are hol-

low, end in the said apparent *Papillary Tunicles*, which with a swelling protuberancy open into the *Renal Receptacle*, and each receive or admit so many little Pipes or Vessels as amount to the number of twelve, and that the same Urinary Vessels are extended from the Circumference to those Teats, as to the Center.

Lastly, *Malpigius* annexes a Question, How Gravel and Stones can descend into the Receptacle of the Kidneys thorough those Fibres and Teats which are so extreamly narrow? To which he answers, That small Gravel may pass through, because the Vessels are membranous and apt to dilate. I rather think he should have said, that the tartarous Substance sticking to the *Serum* that passes thorough, hardens into Gravel and Stones in the Renal Receptacle, after it is slid through those slender Vessels, which frequently happens: Sometimes it hardens also in the Vessels themselves, and having broken 'em, fall into the Receptacle afterwards; and if much of that matter be harden'd in those Vessels, and there remain, then the Substance of the Kidneys becomes gravelly and stony.

The Use of the Reins. XXIV. *The Use of the Kidneys is to separate and evacuate the redundant serous Moisture from the Blood, which is carried to 'em, together with the Blood, through the Emulgent Arteries; from which Blood, in its passage through the Glandules of the Reins, the Urinary Fibres, and the Papillary Caruncles, a good part of the* Serum *is separated, and distills into the Renal Receptacle or* Pelvis, *and thence slides through the* Ureters *to the Piss-bladder.* But the remainder of the Blood and mix'd serous Humour (for all the *Serum* is not separated from the Blood) that is sent through the Emulgent Veins to the *Vena Cava*.

The first Digression. XXV. *But how that separation of the* Serum *is made, is hard to explain.* For that the two first things upon which the Explication depends, are altogether obscure, that is to say, the Specific Fermentation, and the peculiar disposition of the Pores in the Reins.

How the Separation of the Serum *is made.* XXVI. *For, that there is a certain Specific Effervescency or separating Fermentation in the Reins, or about the Reins, by which part of the* Serum, *together with the Impurities mix'd with it, is separated from the Blood; three Reasons teach us.* 1. *First*, For that most Diureticks abound with Salt, which causes that Fermentation; nay, many of these Diuretics are Salts themselves, as *Salt of Beans, Vine-stalks, Juniper, Prunella, &c.* 2. Because *Sudorifics* (by which the *Serum* is separated from the Blood) are very effectual, whether *Salt of Wormwood, Carduus, Mother-wort, &c.* or such as are endued with an *acid Salt*, as *Vinegar*, *Oyl of Vitriol* or *Sulphur*, *Spirit of Salt*, and the like, which cause or increase that Effervescency. 3. For that in cold Distempers, as the *Anasarca*, by reason of the weak Constitution of the Liver, because there is not a strong and sufficient Ferment prepar'd, for which reason the crude *Serum* is not sufficiently separated from the Blood, not yet attenuated; thence it happens that very little Urine is discharg'd, tho' the *Serum* abound in all parts of the Body, and distends all the parts with a sensible Tumour.

But how by that Effervescency part of the *Serum*, with its Impurities, comes to be separated, and what form it assumes to pass alone through those narrow and porous passages of the Kidneys, the Blood being excluded from 'em, whoever can demonstrate this, deserves the Laurel.

Whether by the Kernels? XXVII. *Here the Glandules of the Kidneys assume to themselves a great priviledge, in which very few doubt but that there is a peculiar power of separating the* Serum *from the Blood.* But in regard that besides the *Serum*, Matter also, slimy Flegm, and other Humours * much thicker than the Blood it self, nay, Gravel and Stones are discharged with the Urine; hence whether this Separation of the Blood be to be ascrib'd to the Glandules alone, was question'd by many; who therefore joyn'd to their assistance a specific disposition of the Pores in the Kidneys, no less obscure and unknown than the foresaid specific Fermentation, and peculiar power in the Glandules to separate the *Serum*.

* *This may be much doubted whether that which after pissing, when the internal heat of it is vanished, appear to be Matter, slimy Flegm, or other very thick Humours, came so thick out of the Reins, or that Gravel or Sand should be sent out of the Blood in that largeness: I think, yea know the contrary; and that those so thick Humours, Matter, or Flegm, are as thin as the rest of the Urine from the internal heat of the parts; after the same manner as it happens in Gelly-broths, which while very hot, will be liquid and fluid, but having lost their heat, become thicker: the same happens in the Reins, but with this difference, that the glutinous Substance is less in proportion to the quantity of Urine, than it is in Gellies, and therefore being cold cannot be so thick and stiff: So Sand or Gravel, while in the Blood, is no such thing, but a soft Paste or Tartar, which after hardens in that form.* Salmon.

For

For who, I would fain know, will unfold to us, wherefore the *Serum*, with the Humours contain'd in it, ſeparated from the Blood by the foreſaid ſpecific Fermentation, deſcend through the Pores of the Kidneys and Glandules, without any Blood, when in the mean time, the purulent Matter brought from the Breaſt, and altogether mix'd with the Blood, has been often ſeen to paſs through the ſame Pores without any Blood? Thus in *Obſerv.* 1. the Year 1638. I cur'd a Merchant of *Nimmeghen*, who was troubled with an Impoſthume, which was at length diſcharg'd through the Urinary Paſſages in two days time, with ſome pain in his Ureters, two Chamber-pots full of white Matter well concocted, and ſomewhat thick, and ſo was free'd from his *Apoſteme*. Whereas before the ſame Matter (the Fluctuation of which was not only perceiv'd by himſelf, by reaſon of his difficult breathing, but alſo was eaſily heard in the ſtirring of his Body backward and forward) threaten'd him not only with a Conſumption, but with certain Death.

Obſerv. 2. XXVIII. *Something to the ſame purpoſe I alſo obſerv'd in the Year* 1639. *in a Servant of the Lord of* Soulen, *who being troubled with an* Apoſteme *in his Breaſt, all the Matter was diſcharg'd through the Urinary Paſſages, with a terrible pain in the Loyns and Ureters, by reaſon of the diſtenſion of the parts cauſed by the paſſage of the thick Matter.* *Andrew* *Obſerv.* 3. *Laurentius* alſo, *Anat. l.* 9. *quæſt.* 12. relates a Story of the ſame nature, by him obſerv'd in a certain Perſon troubled with an *Empyema*, whoſe Body being opened, he found a certain ſort of ſtinking Matter in great quantity in the Concavity of the Breaſt and the left hollowneſs of the Heart, of the ſame nature with that which came from him with his Urine, which was a certain ſign that it came from the Breaſt through the Heart to the Kidneys.

The thing farther conſidered. XXIX. *Theſe and ſuch like things, while others conſider and obſerve a difficult Explication of the Matter, they reject the Glandules, and affirm the whole Buſineſs to be done by the ſole peculiar diſpoſition of the Pores in the Kidneys, that is to ſay, their Aptitude and Structure, which they cannot deſcribe, neither by means whereof the thick Matter finds a paſſage through them, but the thinner Blood cannot paſs.* Fling, ſay they, thin Chaff, Peaſe and Beans, into a Country Farmers Barn-Sive, the thicker Peaſe and Beans eaſily paſs through the Holes, but the long thin Chaff remains in the Sive. But tho' the aptitude of the Pores in dry things may occaſion ſuch Accidents, 'tis much to be doubted, whether in liquid and fluid Bodies mix'd together, the ſame thing may happen, eſpecially when neither exceeds the other in fat; that is to ſay, whether a Subſtance four times thicker than the Blood, by reaſon of the ſaid Structure of the Pores alone, may be able to paſs through ſuch narrow Pores, which do not only not give paſſage to the blood that is mix'd with it, and is much thinner, but ſtops it. Whether alſo the blood which is ſo thin and fluid, that it has been ſometimes ſeen to ſweat through the Pores of the Skin, coming to the Pores of the Reins, cannot as eaſily, or rather much more eaſily be ſhap'd to the form of the Pores of the Reins, than Matter which is ſo thick, that it can hardly paſs thorough the *Ureters*, but many times extreamly torments 'em by their diſtenſion. And ſo that Reaſon, as to the particular Structure of the Pores of the Reins, ſeems hardly ſufficient to explain the ſaid Evacuation; therefore there is ſomething yet lies hid which no body yet could ever diſcover: In the mean time, tho' the Cauſe of this thing do not manifeſtly appear, this is certain as to the thing it ſelf; and we our ſelves have ſeen Matter carried from the Breaſt to the Kidneys and Bladder, diſcharg'd in great quantity, without any intermixture of blood.

The thing conſidered in ſolids. XXX. *But we ſhall not inſiſt altogether upon Liquids; what ſhall we ſay of things that are ſolid and hard, are they alſo ſhap'd in like manner, ſo as to be ſtrain'd through the Pores of the Kidneys, without any concomitancy of Blood?* Yet there are ſeveral Examples of hard things that are diſcharg'd with the Urine, without any blood attending. Thus *Longinus* relates a Story of a Virgin, that being ſurpriz'd with a ſuddain laughter, ſwallow'd three Needles which ſhe held in her Mouth, which came from her again in three days with her Urine. *Alexander Benedict. l.* 3. *Anat. c.* 9. writes another Story of a Pack-needle, four fingers breadth long, which deſcended into the Bladder, and was afterwards found in the diſſected body. *John Matthæus* alſo relates, that a ſmall Iron Nail being ſwallow'd unawares, was taken a long

long time after, cut of the Bladder with a Stone cut out at the same time; (the Stone cleaving round about the Nail, as if the Nail had been the groundwork of the Stone. My Wife swallow'd a small Needle that carried an ordinary Thred, which in three days came from her again with her Urine, *August* 8. 1665. Nor did the Needle put her to any pain while it lay in her Body. *Julius Alexandrinus* has observ'd little pieces of the Roots of Parsly, as big as a farthing, swallow'd the day before, discharg'd again with the Urine. *Nicholas Florentine* reports that a Person, who had eat Mushrooms not exactly concocted, piss'd out again remarkable Bits of 'em with his Urine. *Plutarch* relates the Story of a Man, who after a long difficulty of his Urine, at length voided a knotted Barly-stalk. *George Jerome Velschius Observat.* 60. relates another Story of one that was wont to void Grape-stones, bits of Lettice, and Meat, together with his Urine. And of another, that when he drank the hot *Bath*-waters, frequently voided with his Urine whole pieces of Melon-seeds which he was us'd to eat. *Pigræus* and *Hildan* tell ye of some that have piss'd out *Aniseeds* and *Alkekengi*. All which things, it is both said and believ'd by most hitherto, do pass through the narrow streights of the Kidneys, where the blood cannot make its way. How then will the adapted disposition and structure of the Pores aforesaid suffice? I hardly believe it. For that such hard and large Bodies, passing the milkie Vessels, should first pass the *Vena Cava*, and nigh the Cavity of the Heart, thence through the narrow and scarcely visible passages of the Lungs, to the left side insensibly, without any pain or prejudice, and then be conveyed through the *Aorta* and Emulgent Arteries to the Kidneys, and be strain'd through their *Urinary Fibres* and *Papillary Pores*, and that no blood should go along with 'em, surpasses both Belief and Reason, nor can be prov'd by any Experience, seeing that no Physician or Anatomist ever found Needles, Seeds, Straws, or any such like things swallowed, either in the *Vena Cava*, the Ventricles of the Heart, the Lungs, the *Aorta*, or the Kidneys.

Annot. ad c. 14. de Substan. fac. Natural.

Serm. 4. Tract. 4. c. 29.

L. 8. Sympos. Prob. 9.

Other passages supposed leading to the Bladder.

XXXI. *These things when formerly I seriously consider'd with my self, and withal bethought my self that they who in great quantity drink the Spaw Waters, and other sharp and diuretic Waters, in half an hours time evacuate forth again three, four, or more pound of* Serum, *without any alteration of the Heart; and that it is very unlikely that so great a quantity of crude and uncoloured* Serum *should so suddainly pass through the Heart, Lungs, and Kidneys, without any prejudice.* I began to think that of necessity, besides the Veins, there must be some other Passages through which the more copious *Serum*, and those hard Substances already mention'd come to the Bladder.

The milkie Vessels to the Bladder and Womb.

XXXII. *And these ways or passages I suspected to be certain milkie Vessels, which are carried to the Bladder through occult and hitherto unknown ways; and tho' not in all, yet in some men are so open toward the Bladder, that they are sufficient to transmit the* milkie Chylus *and plentiful* Serum, *but also solid, hard, and long Substances.* And this Conjecture of mine the Observations of Physicians seem to confirm, who have sometimes seen the Chylous milkie Matter evacuated with the Urine. *Nicholas Florentine Serm. 5. Tract. 10. c. 21.* reports that he knew a young Man about thirty years of Age, who every day voided, besides a great quantity of Urine, without any pain, about half a Urinal full of Milk. *Capellus* the Physician, by the Testimony of *Bauhinus*, saw a Woman that evacuated half a Cup full of Milk out of her Bladder. *Andrew Laurentius* has observed several Child-bearing Women to have voided a great Quantity of Milk out of their Wombs and Bladders. Whence it is manifestly apparent that some *milkie Vessels* run forth, not only to the Womb, but to the Bladder, and may discharge themselves into those parts, if there be no Obstruction, that is, if those Vessels are not obstructed, compressed, or stop'd up by some other means, as they seem to be in most men; which is thought to be the reason that the *milkie Chylus* so rarely flows to the Bladder. But in regard these Passages are short, and not so winding as many others are, it may easily happen that other solid Substances, besides the *Chylus*, may pass through 'em, as Seeds, Needles, Straws, *&c.* But much more easily may a great part of the crude *Serum*, increas'd by much drinking, flow through these Passages, and be evacuated through the Bladder, in regard so large a quantity of blood cannot be so suddainly run through other Vessels,

Veſſels, and circulate through the Heart. And hence it is that ſuch Urine proves of a watery Colour, differing much in Colour and Conſiſtence from that Urine which is concocted with the blood, which follows well colour'd after the Evacuation of much copious crude *Serum*, and manifeſtly ſhews that it paſs'd through other parts, (than the other crude *Serum*,) that is, through the Lungs, Heart, and Kidneys, and there obtain'd a larger Concoction. I alſo conjectur'd that thoſe Liquors which we drink, and whoſe colour and ſmell remains in the Urine, are carried the ſame way; for ſhould they paſs through the Heart, they would loſe both. *Actuarius l. 2. de Jud. Urin. c. 20.* relates the Hiſtory of a ſick Perſon to whom he had given a *black Medicin*, who ſoon after made *black water* without any prejudice. And many times Midwives, by the colour and ſmell of the Excrements that flow from Child-bearing Women, know what the Woman with Child has been eating before. *Saffron* being given in drink to a Woman in Labour, in a quarter of an hour dy'd the Birth of a yellow Colour, and yet the Saffron could not paſs through the Heart in ſo ſhort a time, nor from thence be ſent to the Womb, much leſs preſerve its Colour entire in paſſing through ſo many ſeveral Chanels. *John Ferdinand Hertodius*, fed a Bitch for ſome days before ſhe whelp'd with Meat dy'd with Saffron, and after he had open'd her, found the Diſſolution or Liquation among the Membranes, and the Puppies dy'd of a yellow Colour, and yet the *Chylus* was white in the milkie Veſſels, not tinctur'd with any other Colour. I my ſelf have ſeen thoſe who have eaten the fat growing to the Kidneys of Lambs, roſted, and in a ſhort time voided it all again with their Urine. *Oyl of Turpentine* immediately imparts its ſmell to the Urine. And *Aſparagus* provokes Urine, crude, muddy, and retaining their own ſmell. Whereas if ſuch Juices ſhould make a long Circuit through the Heart and other Bowels, they could never come to the Bladder ſo ſuddainly, ſo raw, and yet retaining their own ſmell. Which are certain Indications that there are certain milkie Veſſels occult, and taking another Courſe than the reſt, which extend themſelves, ſome to the Womb, and ſome to the Piſs-bladder, and that Liquors of this nature, and other ſolid Subſtances, may ſometimes through thoſe more open Chanels, reach thoſe parts. Which Veſſels, tho' hitherto they were never conſpicuous to the ſight, nor demonſtrated by any Anatomiſt, yet of neceſſity muſt be there. Such *milkie Veſſels* extended toward the Teats, are not to be ſeen, and yet that there are ſuch Veſſels, ſtalks of Herbs eaten the day before, and voided through the Paps, and Broth dy'd with Saffron, flowing out at the Teats of the ſame Colour, ſufficiently declare. Now if theſe Veſſels in the Teats are inviſible to the Eyes; what wonder that they which tend to the Womb and Bladder ſhould not be diſcover'd? However, for the better clearing of this difficulty, I would deſire all *Anatomiſts*, that they would uſe a little more than ordinary diligence in the ſearch of theſe Veſſels for the common benefit, to the end that what is now but meerly conjectur'd at, may come to be evident by ſolid Demonſtrations.

Others there are who never thinking of the *milkie Veſſels*, have invented, or at leaſt imagin'd other ways.

Bartholine's *Opinion, that there is ſome other and ſhorter way.*

XXXIII. Bartholine l. de Lact. Thorac. l. 6. & 9. *believes that this ſame thick Matter, Needles, the milkie Juice, and the like, and in great Drinkers, and thoſe that cannot hold their Water, the Liquor they drink, nothing or very little alter'd, are carried by a direct and ſhort way to the Emulgent Arteries, and ſo through the Kidneys to the Bladder.* But theſe Paſſages are not confirm'd by ſight, becauſe thoſe Chanels from the Chyle-bearing bag to the Emulgent Arteries are not to be found, nor any Branches carried to the Sweet-bread and Liver, of which he alſo diſcourſes in the ſame place: and therefore the *Lymphatic Veſſels* ſeem to have deceived *this learned Perſon*, as well as many others. Moreover, grant that the *milkie Veſſels* reach to the ſaid parts, yet how is it poſſible that Needles, Bodkins, and the like, of a great length, and not to be bent, ſhould paſs through thoſe narrow and winding porous Paſſages of the Subſtance of the Reins? And therefore of neceſſity this Invention of ſo famous a Man, muſt fall to the ground.

Clemens Niloe *his Opinion.*

XXXIV. Clemens Niloe *writes that ſome of the milkie Veſſels are carried to the* Vice-Reins, *or black Choler Kidneys, call'd* Capſulæ Atrabilariæ, *and that from thoſe the ſerous Liquors flow to the external Tunicle, and thence farther through the Ureters to the Bladder.* But the *Hypotheſis*

potheſis falters, or rather fails altogether in this, that the *Hypotheſis* was firſt to be prov'd that the *milkie Veſſels* are carried thither. Beſides, there is no paſſage from theſe *black Choler-Cackets* to the *Ureters*, but they diſcharge themſelves into the *Emulgent Veins*, or *Vena Cava*, and ſo nothing can come from them to the *Ureters*.

The Opinion of Bernard Swalve *in this matter.*

XXXV. Bernard Swalve *going about to ſhew more manifeſt and ſhorter ways, writes, that the* Bath-*waters, acid Juices, and any Liquor plentifully drank is eaſily ſuck't up in the Stomach by the Gaſtrick Veins, gaping preſently upon their approach, and ſo are immediately carried to the Heart.* But the vanity of this Fiction is every way apparent. For the more plentiful draughts of acid Liquors, whether Wine, or any other Liquid Juice, were receiv'd by the *Gaſtrick Veins* in the *Ventricle*, muſt of neceſſity be carried then to the *Vena Portæ*, the Liver, the *Vena Cava* and the Lungs, and in ſo long a way, and paſſing through ſo many Bowels, muſt of neceſſity be ſubject to a remarkable change; and alter their colours, whereas before they are preſently piſs'd out without any colour at all. Nor could they retain the Tinctures of *Saffron*, *Rubarb* and other things, and be piſs'd out as they are with the ſame hue and ſmell as they went in. Moreover, by the Confeſſion of *Swalve* himſelf, there is nothing thick or chylous canpaſs through thoſe ways, by reaſon of their extraordinary narrowneſs; whereas we find by experience, that Matter, Needles, Milk, and black Phyſick, has been preſently diſcharg'd by Urine. Then again, if ſo great a quantity of cold Acids, as is commonly conſum'd in a ſhort ſpace, ſhould be carried through the forementioned paſſages, certainly the heat of the Liver, Heart, and Lungs, would be extinguiſh'd by that ſame actual Cold, and the whole Body would become colder than Marble, and ſo ſhortneſs of Breath, Dropſies, and ſuch like Diſtempers would preſently ſeize all thoſe that drink thoſe Liquors: whereas experience tells us that thoſe Diſtempers are cur'd by Acids.

Thus the Opinions of Doctors concerning a ſhorter way to the Bladder are very uncertain, among which nevertheleſs our own above mention'd ſeems to be moſt probable, till another more likely be diſcover'd.

Whether there be a conſent between the Kidneys.

XXXVI. Foreſtus, Duretus, *and after them* Beverovicius *and* Laſelius, *write, that one Kidney being obſtructed, the other becomes uſeleſs, and loſing its own action, intercepts the flowing of the Urine*; *which* Riolanus *ſays has been more than once obſerv'd by himſelf*; *which he alſo believes comes to paſs by reaſon of the ſympathy between each other, by reaſon of their partnerſhip in duty*; *and hence if the one be out of order, the other growing feeble, immediately languiſhes*: Which *Veſlingius* alſo intimates in few words. But in this particular I take Experience to be prefer'd before the Authorities and Opinions of the moſt learned Men, which has many times taught us the contrary; that is to ſay, That one Kidney being obſtructed, or any other way diſtemper'd, the other remains ſound, and makes ſufficient way for the Urine, of which I could produce ſeveral Examples, which for brevities ſake I omit. Sometimes indeed we have ſeen, that by a Stone falling down upon one Kidney, the paſſage of the Urine has been ſtop'd; which has not happen'd by reaſon of any ſympathy, but becauſe unfelt by the Patient, the other Kidney had been long obſtructed before, and yet the Urine having ſufficient paſſage through the oppoſite Kidney: which oppoſite Kidney being by chance obſtructed likewiſe, preſently the paſſage of the Urine is quite ſtop'd up. Which the Diſſections of dead Bodies apparently teach us. For many times we have found one *Ureter* quite obſtructed near the *Oriſice*, which the ſick Perſon never perceived in his life time, while his Urine paſs'd freely through the other. Nor did we ever obſerve a total ſuppreſſion of Urine, where the Kidneys were faulty, but we found upon Diſſection both Kidneys obſtructed. The *Lord Wede*, a Noble man of *Utrecht*, often at other times ſubject to *Nephritic Pains*, found his Urine of a ſuddain ſuppreſt by reaſon of an Obſtruction in his Kidneys, and yet without any pain: Preſently that ſame whimſey of conſent came into the Phyſicians heads, believing that one Kidney was ſuddainly obſtructed, and that the other fail'd in its Office by conſent. At length all Remedies in vain attempted, in fourteen days he dy'd. But then his Body being open'd, in both Kidneys was found a Stone of an indifferent bigneſs, ſhap'd like a Pear, that was fall'n upon the Orifice of the *Ureter*, and had quite

Second digreſſion.

quite damm'd up the urinary Passage. Who would now have thought that in both Kidneys two Stones should be fallen at the same time upon both the Orifices of the Ureters? And therefore it is most probable that long before, one Kidney had been obstructed, tho' he felt no great Prejudice by it, so long as the other was open; but when the Stone fell upon the Ureter of the other Rein, then the Urine was altogether suppressed. Certain it is, that that Suppression of Urine was not caused by the Obstruction of one Kidney, and consequently not by any sympathetical Affection of the other. It is also farther to be noted that in the Dissections of Dogs, we shall often find in the one Kidney a long, thick, ruddie Worm that has eaten all the fleshy Substance of the Bowel, whereas there could be nothing more sound than the opposite Kidney; which shew'd no sign of Sympathizing with the Misery of the other.

Whether the Kidneys concoct Blood.

XXXVII. *But tho' it be the only Office of the Reins to separate the* Serum *from the Blood, nevertheless some more narrowly considering their fleshy Substance and peculiar Bigness, attribute also to 'em the Function of preparing and farther elaborating and concocting the Blood*; Which Opinion *Deusingius*, following *Beverovicius*, most stifly defends. But if by Concoction he means that Elaboration only, by which the serous Excrement is separated from the Blood, then his Opinion may be tolerated: But if such an elaborate Concoction, by which the Blood is made more Spirituous and Perfect, then his Opinion is to be rejected, there being no Bowel that brings the Blood to greater Perfection than the Heart, from which the more remote it is, the more imperfect it is: Nor can any thing of its lost Perfection be restor'd by any other Part, no not by the Kidneys themselves. For which Reason the Blood must return to the Heart to be restored to its pristine Vigor.

Another Action.

XXXVIII. *Besides the foresaid Office, others according to the Opinion of* Sennertus *ascrib'd another Action to the Kidneys, which is the Preparation of Seed: Which they uphold by several Reasons, of which these are the Chief.*

1. Because the Kidneys have a peculiar *Parenchyma* as the rest of the Bowels have; now in regard there is a peculiar Power of Concoction in the peculiar Flesh of every one of the Bowels, that peculiar Quality must not be deny'd the Kidneys, which can be no other than a seminific Concoction, when Straining is sufficient for the Separation of the *Serum*, and there is no need of Concoction.

2. Because the emulgent Arteries and Veins are too large to serve only for the Conveyance of the *Serum*, it seems most probable that a great part of the Blood being separated from the *Serum*, is concocted in the Kidneys into a seminal Juice, which is to be further concocted in the Testicles.

3. Because when the Seed is suppressed and over much retain'd, the Kidneys are out of Order.

4. Because Topics apply'd to the Region of the Kidneys, prove beneficial in a *Gonorrhea*.

5. Because a hot Constitution of the Reins causes a Proclivity to Venery, lustful Dreams and Pollutions; and the hotter it is, the sharper the Seed is.

Refutation.

XXXIX. But these are chaffie Reasons, and of no force, to which we answer thus in order.

1. That the Kidneys indeed are certain straining Vessels, whereby good part of the *Serum* is separated from the Blood that passes through, and falling into the Renal Receptacle flows out again. But this Straining can never be, unless a certain necessary specific separating Fermentation precede, separating the Blood from the *Serum*; and so the Kidneys do not simply separate the *Serum* by straining, but transmits, as it were, through a Sponge, that which is separated by the said Fermentation. Moreover because a great Quantity of *Serum* is to be separated and transmitted, hence there is a a Necessity for larger and greater Strainers. For if so much *Serum*, separated by continual Fermentation, were to be strain'd through small Strainers, would they be so loose, that together with the *Serum* separated by the said Concoction, the thinner part of the Blood would also slip through 'em.

2. Much of the Blood were to be carried through the emulgent Arteries being very large for the Separation of a moderate part of the Blood only, for the Blood was not to be depriv'd of all the *Serum*, to preserve it fluid. But through the Emulgent Veins nothing flows to the Kidneys, as is apparent from the Circulation of the Blood, and the Valves which are placed at the Entrance of the emulgent Veins into the *Vena Cava*. Lastly, neither does that

Consequence follow. Much Blood flows to the Reins, and therefore out of some part of it the matter of the Seed is prepared in the Kidneys.

3. Nor does that other Consequence. The Kidneys are out of Order through Retention of the Seed; Therefore the Kidneys both prepare and supply the Matter of the Seed. For then this Consequence would be as true. The Head-ach proceeds from the Retention and Boyling of the Choler, therefore the Head prepares Choler.

4. Neither is this Consequence true. Topics apply'd to the Region of the Kidneys are beneficial in the *Gonorrhea*, therefore the Kidneys supply seminal Matter. For then would this be as certain. Cold Water apply'd to the Testicles stops bleeding at the Nose, therefore the Testicles made Blood to be carried to the Nostrils.

5. A hot Constitution of the Kidneys is a Sign of Proneness to Lust, but not the Cause. For this is usual that where all the spermatic Vessels are hotter, there the Kidneys are also hotter. Not that the Kidneys add a greater Heat to the Seed: But the Vapors rising from the hot Seed, heat and warm the Kidneys. So that in Brute Animals that are ripe and libidinous, not gelt, you shall perceive a certain seminal Savour and Taste in the Kidneys.

That no Specifick Vessels are extended from the Reins to the Testicles.

XL. *Lastly we may add for a Conclusion, that no specific Vessels are extended from the Kidneys to the Testicles, through which the seminal Matter can be carried thither.* That the spermatic Arteries carry blood to the Testicles out of the Trunc of the *Aorta*, and the Superfluity flows back through the spermatic Veins to the *Vena Cava* (whose Valves are so plac'd, that nothing can slide through them to the Testicles) and so these Vessels cannot perform that Office, and as for other Vessels there are none.

Whether Wounds in the Kidneys be mortal.

XLI. *From what has been said it appears, that the Kidneys are Parts that evacuate the serous Excrement, most necessary for the Support of Life. The Question is therefore whether the Wounds of the Kidneys are mortal or no? We must say, they are Mortal, and that of a hundred wounded in the Kidneys, scarce one recovers perfect Health.* Which Lethality proceeds not from the Nobleness or Excellency of the Reins, but from the Concourse of supervening Symptomes. That is to say, a vast Flux of blood cutting off the Vessels, Obstruction of Urine, or else the Impossibility of the Retention of it: Great Pain, Inflammation, Exulceration, Apostumation, by reason of the continual Thoroughfare of the sharp *Serum*, difficult to be cured; and other Accidents that weare the Strength of the Patient to Death. For tho' the Kidneys are not principal Parts, yet are they such, the use of which we cannot want, which Use being either wholly suppressed or obstructed, Life ceases. True it is that some People who have been wounded in the Kidneys have liv'd, and to the more unskilful have seem'd to be cur'd, but at last the reviving Apostumes have carried off the Patient. Thus *Fallopius*, *Cornelius Gemma*, *Dodoneus*, *Forestus*, *Valleriola*, and others, relate various Examples of Persons wounded in the Kidneys who superviv'd for some Years, but at length however they dy'd of those Wounds. But that some die sooner, some later, the Reason is this, that some Wounds are more or less deep, and the attending Symptomes more or less violent. However for my part in all my five and forty Years Practice, I never saw any body wounded in the Reins that ever perfectly recovered, tho' I have met with many such Wounds to be cured, especially when I practised young in the Camp; which makes me admire the Vanity of so many Surgeons, that dare bragg they have many times perfectly cured People wounded in the Kidneys. But what shall we then say of the cutting of Stones out of the Kidneys? To which *Avicen* inclines, *Canon. l.* 3. *Fen.* 18. *tract.* 2. *c.* 18. Of which also *Pareus* writes, *lib. de Affect. When it swells and bunches out (meaning the Stone of the Kidney in the Loyns) at that time you must cut near the Kidney, and draining out the Matter, cure the Gravel with Medicaments provoking Urine.* But we must say that whoever has a Stone cut out of the Kidney cannot supervive the Section. 'Tis reported that such a Cure once was undertook and accomplished with Success in *Spain*, upon a Person condemn'd to die. But if it were true, as is greatly to be doubted, it is to be numbered among the Miracles.

A Plexure of Nerves between the two Kidneys.

XLII. *Here by the way we are to observe, that there is a certain Plexure of Nerves between the two Kidneys under the Ventricle, consisting of a double Costal, and Stomachical Nerve;* From which all the Parts of

of the lower Belly borrow their Nerves, of which more *l.* 3. *c.* 8.

CHAP. XIX.

Of the Capsulæ *or Deputy Kidneys.*

The Names. I. THE Capsulæ *Kidneys by* Julius Casser *are called the Deputy Kidneys, by* Wharton *the Glandules adjoyning to the Nervous Plexure, by* Bartholine *the black Choler Cases, or* Capsulæ Atrabilariæ.

Situation. II. *They are two Glandulous Bodies, of which one leans upon each Kidney, where they look toward the* Vena Cava *under the* Diaphragma, *at the upper Part of the* Membrana Adiposa, *to which it sticks so close, that oft-times it is overseen by the more Negligent, and the Kidneys being taken out, is left annexed to the Membrane of the* Diaphragma.

The left *Glandule* is neareſt the *Diaphragma*, the right is neareſt the *Vena Cava*; and the left is placed somewhat higher than the right: But in Brutes for the most part neither joyn close to the Reins, but ly distant about the breadth of half a Thumb, and plac'd somewhat toward the *Diaphragma*, the Fat lying between.

They are found in that Place where the *Nervous Plexure* is to be seen, to which they are firmly knit.

The Number. III. *They seldome exceed the number of Two.*

Substance. IV. *Their Substance is not much unlike the Substance of the Kidneys, but looser, sometimes of a ruddy Colour, sometimes like Fat.*

The Figure V. *In Shape they are seldome like the Kidneys (and yet I have more than once seen 'em exactly represent the Figure of the Kidneys) but frequently like a piece of flat Past; between Square and Oblong: Sometimes also they are Triangular and Oval, but rarely Round.*

Bigness. VI. *In grown People they are much less than the Kidneys; extended to the Quantity of a vomiting Nut, and the right uses to exceed the left in bigness, seldome the left exceeds the right.* In the birth and Children till almost half a Year old, they almost equal the Kidneys; but afterwards they do not grow proportionably to the rest of the Parts; and when the Privities begin to have Hair, they cease to grow any more. However they do not diminish again in grown People, as some have averr'd. For in Consumptions and Hectic Feavers where all the Parts are emaciated, these remain sound and untouch'd, and preserve their wonted bigness.

Tunicle. VII. *They are wrapt about with a thin Tunicle, by which they are strongly fasten'd to the outward Membrane of the Kidneys.*

Concavity. VIII. *They have an apparent Concavity full of Windings and Turnings, but so little that it will hardly admit a Pea, and therefore more Conspicuous in the Birth than in grown People, which contains a black feculent Matter, with which Colour also the Inside of it is also tinctured.*

Wharton's *Observation.* IX. Wharton *observes that a great number of little Holes proceeding from the very Substance it self of these* Glandules *terminate into this Concavity with gaping small Orifices, but that the Cavity it self opens into the next Vein, and is there fortifi'd with a Valve, opening toward the Vein, but closed behind.* This they send from themselves for the most part to the Emulgent, sometimes to the *Vena adiposa*, sometimes they insert a small Twig of the *Vena Cava*, proceeding out of their Cavity with a large and broad Orifice.

Artery from the Emulgent. X. *They also borrow an Artery from the Emulgent, and sometimes one or more Branches from the Trunk of the* Aorta.

Nerves from the Ramus Thoracicus. XI. *They admit very small little Nerves from the Stomach Branch of the sixth Pair, running to the proper Tunicle of the Reins.*

Use of these Glandules not well known. XII. *The use of these* Kernels *is hitherto unknown.* Some with *Veslingius* believe that they help to draw the serous Moisture, and collect the black Choler, which like a Rennet provokes the Separation of the *Serum* from the

Blood. *Spigelius* thinks 'em made to fill up the *Vacuum* which is between the Kidneys and the Diaphragma, and for a Prop to the Stomach in that Part, which is above the Emulgent Veins and Arteries; Others think that they ſupport the Diviſion of the *Retiform'd Plexure* of Nerves. *Riolanus*, That they are of no uſe in Men grown to Maturity, but that their Uſe is only to be ſought for in the birth, wherein he believes they receive a certain Juice appropriated to the Generation of the Kidney Fat; for that in the body of an Infant there is no Fat generated till after he is brought forth into the World, at what time that Juice formerly collected is produced into Act. *Gliſſon* believes that they ſeparate the Juice that ſerves for the Nouriſhment of the Nerves from the reſt of the blood, that it may be carried pure to the Nerves. All which Opinions nevertheleſs are meerly conjectural, and lean upon no ſolid Foundation. *Wharton* believes that there is a certain Juice unapt for the Generation of Nerves exonerated into theſe little Coffers from the Plexures of the Nerves upon which they lean; which Juice however flowing from thence into the Veins, may there be uſeful for other Purpoſes. But neither is this any other than a meer uncertain Conjecture, for that it is hardly credible that either this or any other thick and feculent Humour could be conveighed through the moſt narrow Pores of the more ſolid Subſtance of the Nerves. *Others* conjecture that there is a certain Rennet prepared in theſe *Glandules*, which flowing from thence to the Kidneys, cauſes therein a quick Separation of the *Serum* from the blood. Which Opinion certainly carries with it great Probability; if the way from theſe Paſages to the Kidneys could be demonſtrated. But what if we ſhould ſay, That that ſame black Juice is prepared out of the Arterious Blood, and obtains a certain fermentative Power, neceſſary for the Venal Blood, for which reaſon it flows from them not to other Parts, but endued with the ſame Quality flows through the Veins proceeding from the *Capſulæ* to the *Vena Cava*: But neither is this any more than a Conjecture.

Hence becauſe the Uſe of theſe Glandules is ſo little known, I am perſuaded it happens, that they were never taken into due Conſideration by any of our Phyſicians: Whereas we find that many Diſeaſes ariſe from their being out of Order. And therefore it is to be hop'd that all Practiſers, both Phyſicians and Anatomiſts, will for the future obſerve theſe Parts more diligently, and by frequent Diſſections of dead Carkaſſes inform themſelves what Diſeaſes their Diſorder and ill Temparature may occaſion.

CHAP. XX.

Of the Ureters.

I. THE *Ureters*, οὐρητῆρες *from* οὐρεῖν *to make Water and* πόροι φλεβικοὶ, *are certain oblong and white Veſſels, or round Channels proceeding from the Kidneys receiving the* Serum *ſtrein'd from the Reins, and carrying it to the Bladder, together with the Gravel, Choler, Matter, and other Juices mix'd with the* Serum. *Definition.*

II. *They ariſe from the inward Concavity of the Kidneys, whoſe various* Pipes *meeting and cloſing together, form the Ureter.* *Source.*

III. *One is generally granted to each Kidney, ſeldome any more are found,* tho' it were twice my chance to find more; which two Ureters however were united on both ſides near the Bladder, and enter'd it with an Orifice. *Number.*

IV. *They conſiſt of a thick two-fold and white Membrane, the outermoſt common, the innermoſt peculiar.* But *Riolanus* more judiciouſly acknowledges but one peculiar Membrane, for that there is no outermoſt common Membrane joyned to it from the *Peritonæum*. The *Ureters* generally are contained under the *Peritonæum*, together with many other Parts, but they are not particularly enfolded by that Membrane, nor receive any peculiar Tunicle from the *Peritonæum*, as the Ventricle, the *Vena Cava*, the Liver and many other Bowels and Veſſels do. But the peculiar and only Membrane of which they conſiſt, is a Membrane ſtrong, nervous, ſtrengthened with ſome Fibres, oblique and ſtreight, and Arteries and ſmall Veins from the neighbouring Parts; and furniſh'd with Nerves from the ſixth Pair and the Marrow of the Loyns, which endue it with an exquiſite Senſe of Feeling: Which little Nerves however *Riolanus* will not allow *The Subſtance.*

the

the *Ureters*, believing it enough to excite Pain, that they are Membranous, seeing that from the distension of a Membrane by a Stone or any sharp Substance, there follows a Pain severe enough to be endur'd. Wherein he mistakes, for that any such thing can happen without the flowing in of the Spirits through the Nerves, is prov'd from the Palsey, in which Distemper the Membranes do not feel, through the Defect of Animal Spirits, nor do they display the least sign of Feeling that may be thought to proceed from their Structure and Composition.

Bigness. V. These are very small in a Man; about a Handful in length, and about the breadth of a Straw: Tho' sometimes they are very much dilated by Stones passing violently through and with a tormenting Pain; so that sometimes they have been seen as broad as the small Gut.

Situation. VI. They proceed downwards from the Reins above the *Psoæ* Muscles that be in the Hip, between the double Membranes of the *Peritonæum*, somewhat reflex'd toward the lower Parts, and in some manner, by an oblique Course between the Membranes of the Bladder, are inserted about the hinder parts of the Neck of the Bladder, and are continued with the inner Substance of the Bladder, in which place some believe 'em to be fortified with Valves at their Orifices, hindering the Return of the Urine from the upper Parts. Which Valves however *Riolanus*, *Andrew Laurentius*, and *Plempius* call in Question, and say that their oblique and winding Ingress into the Bladder stops the Return of the Urine out of the Bladder, for which Opinion we also give our Vote.

CHAP. XXI.

Of the Piss-Bladder.

Definition. I. THE *Piss-Bladder*, κυστις ἐφέδρυχος, *is a Membranous Organical Part of the lower Belly, which retains the* Serum *received from the Kidneys, and at length discharges it as being troublesom either through its Weight or Acrimony.*

Situation. II. *It is seated in the* Hypogastrium, *between the double Tunicles of the* Peritonæum, *in the Cavity which is form'd by the* Os Sacrum, *the Hip-Bone and Share-Bone.* In Men it leans upon the *Intestinum Rectum*, and is joyn'd to the *Prostatæ Glandules*; in Women it sticks to the Neck of the Womb, and in both is fastened to the Share-Bone before; and it is also annexed to the Navel by the *Urachus*.

Membranes. III. *It consists of a threefold Membrane, of which the outermost in Men, but not in Brutes, being surrounded with Fat proceeds from the* Peritonæum. *The middlemost, which is thicker is endued with fleshy Fibres for Contraction and Expulsion of the Urine: and hence by* Aquapendens, *and* Bartholine, *called the enfolding Muscle, by* Spigelius *the Thruster downward of the Urine.* This if it be too much distended by too great a quantity of Urine, occasions a total suppression of Urine, because the Fibres of it being too much distended are so weakned, that they cannot contract themselves again. Which sort of Suppression of Urine *Forestus* writes that he himself was troubled with *l.* 25. *Observ.* 14. The innermost is thinner, and being of a more exquisite Sense of Feeling is protected by a kind of Slime from the Corrosion of the Liquor contained in it. This is found very much wrinkl'd in People that are troubl'd with the Stone.

The Figure. IV. *The Figure of it, is oblong, globous, or round, and sometimes, sharp like a Pear.*

Bigness. V. *The Bigness is not alike in all, but in some larger, in some less; which extraordinary largeness is occasioned by its frequent and violent Distensions, by too long a Retention of the Water.*

Its Concavities. VI. *It has one Cavity, which by the Observations of Physicians in some few has been seen distinguished into two, by a Membrane or Fence in the middle.*

Its Holes. VII. *There are three Holes belonging to it, of which the two lesser before the Neck are open to the Entrance of the* Ureters: *The third, which is the bigger, in the Neck gives way to the Urine going forth.*

Its Vessels. VIII. *It receives Arteries from the* Hypogastrics, *entring the sides of the Neck, and carrying thither*

Blood

Blood for its Nourishment: The remainder of which it pours forth through little Veins into the Hypogastric *Vein. It admits Nerves from the sixth Pair and the Marrow of the* Os Sacrum.

Its Division. IX. *It is divided into Bottom and Neck.*

The Bottom. X. *The Bottom comprehends the upper and broader part of the Bladder, from which the* Urachus *is extended upwards to the Navel; which* Urachus *together with the adjoyning umbilical Arteries in People of ripe Years proves a strong Ligament, preventing the falling down of the Bottom upon the Neck.* Of the *Urachus* see more, *c.* 32.

The Neck. XI. *The Neck is the lower and narrower Part, which in Men being longer and straighter is carried to the Root of the Yard, and opens into the Urinary Passage or Piss-Pipe.* But in Women shorter and broader; hanging above over the Neck of the Womb, and opens itself under the *Clitoris*, a little above the Entrance of the Sheath or Matrix between the *Nymphæ*. In both Sexes fleshy, woven out of many Fibres, chiefly Transverse and Orbicular, lying hid among the right Fibres encompassing the whole Body of the Bladder, which constitute the Sphincter Muscle, pulling together the Neck of the Bladder to prevent the Urine from coming away unseasonably, and winding about the *Prostatæ*, as may be seen in the following Chapter. As for those Anatomists that describe several other Muscles of the Bladder, they do but make themselves ridiculous: As the *External Sphincter, the Thruster down, &c.* which are nothing else but the fleshy Membrane of the Bladder.

Its Valves. XII. *Over this Neck in Men toward the Piss-Bladder, a little Membrane overspreads it self, like a small Valve, which prevents the Seed which is forc'd toward the Piss-Pipe from flowing into the Bladder, and the falling of the Urine which flows out of the Bladder into the seminal Pipes.* Which may be demonstrated if a Bodkin be put into the Bladder toward the Piss-Pipe, into which it enters easily without any Obstacle; but not the contrary way, unless by the Force of Dilaceration. This little Membrane is broken by the Immission of a *Catheter* into the Bladder, and sometimes is corroded away in a *Gonorrhea*. *Bartholine* reports from the Observation of *Riolanus*, that this Membrane is to be found in Boys till twenty Years of Age, but not after that. Which Observation I do not take to be any perpetual Rule. For in Practice we have many times broken this Membrane not without great Pain ensuing, in older Men by immission of the *Catheter*. Perhaps *Riolanus* might observe this in the Dissections of dead Bodies in *France*. For the French Youth being extreamly Lustful, and abandoning themselves to their Venery, and frequently Clapp'd, it may easily happen that this Membrane may be eaten away by the corroding Seed, as it passes through the Channel.

CHAP. XXII.

Of the Parts in Men serving for the Generation of the Seed.

See Table 3. & 4.

Preamble. I. *After the Organs of Nourishment, by which the Food is prepared for the Support of the Body, which would else decay, Order and Method require that we should proceed to the Description of the Instruments of Generation*, by which the Perennity of human kind which Nature has deny'd to Individuals is preserv'd by Procreation.

The Privities. II. *These Parts are called* Pudenda *from* Pudor *Modesty, as being those Parts of which Man was not asham'd before Sin.* But after he had sin'd he took notice of his Ignominious Nakedness, and was asham'd. *Theophrastus Paracelsus* writes, that Men before Sin wanted these Parts; but that after Sin committed they were added by the Creator, in perpetual Remembrance of the shameless Fact he had committed: And because our first Parents fell through the Temptation of the Devil, therefore to *Adam* was given a genital Member or Yard like a Serpent, and to *Eve* a Member of Generation like the Serpents Den. Now whether this be the Reason that the *Adamite*'s Serpent is never at rest but when he is entering *Eve*'s Den, and that *Eve*'s Den with so much Love and Desire receives and admits

admits the *Adamite*'s Serpent, I leave to others to dispute.

Genitals. III. *These same Privities, which are also call'd Genitals, being in both Sexes not fram'd alike, necessarily we must discourse of both apart: And first for the Generating Parts of Man*, in the same Order as the Seed is generated, moves within 'em, and is ejected.

The Genital Parts of Men. IV. *The Genital Parts in Men are such Parts as are design'd for a Man to beget his own Likeness in a Woman.* These Parts are divided into Internal and External; of which some ly hid in the Cavity of the *Abdomen*, others are conspicuous without: However all these both outward and internal Parts that serve for Generation are twofold: Others prepare the Seed, of which in this Chapter; others conveigh the Seed into the Womb, of which in the following Chapter.

The spermatic Vessels. V. *Among those which make the Seed in the first place occur the Spermatic Vessels: Which are vulgarly call'd preparing Vessels, because that formerly it was thought the Blood was there prepared for the Generation of Seed.* These are twofold: That is to say, two Arteries, and as many Veins which are more conspicuous and bigger than the Arteries. Some write that they have seen the Arteries bigger than the Veins, which must be preternatural, and contrary to the Circulation of the Blood (for then through large and broad Arteries more Blood would be carried than could be return'd back through smaller and lesser Veins; whence it is probable that such a thing never happen'd, but that the Anatomists that writ so had a Mist before their Eyes.

Spermatic Arteries. VI. *The spermatic Arteries carry Blood for the making of the Seed and the Nourishment of the Testicles: Of which, the Right a little below, the Left close by or a little above the Emulgent, sometimes both together about the Distance of two Fingers under the Emulgent, arise out of the Trunk of the great Artery before.* But then the Right ascending the Trunk of the *Vena Cava* proceeds obliquely to the Vein of the same side, and the Left proceeds directly to the Vein of its own Side. Nevertheless *Riolanus* has observed that both sometimes proceed from the Emulgent; and sometimes not two but one only to have sprung out of the Trunk of the *Aorta*, and to have perform'd the Duty of the two. In like manner, *George Queck* a Physician of *Norimbergh*, observed this single Artery in a dead masculine Body springing from the forepart of the *Aorta*, which being divided into two Branches above the separation of the *Crural Branches*, joyn'd afterwards on both sides to the descending *spermatic Vein*. And by the Relation of *Hoffman*, *Peter Paw*, in the Year 1598. in the dead Body of an old Man, found no more than one *spermatic Artery*, proceeding from the middle Trunk of the *Aorta*, ten times bigger than those Arteries wont to appear in others, and ending in the Testicles, being without question double fork'd before. But these Accidents rarely happen, as in that Person of whom *Cornelius Gemma* writes, *Art. Cyclog. lib.* 2. *Often*, says he, *we have seen three or four seminal Arteries.* In the place of *often*, I had rather he had said *sometimes*: For the increased Number is so seldom found, that of six Hundred Anatomists scarce one has seen it: But generally two *spermatic Arteries* of each side one, spring from the Trunk of the *Aorta*.

Whether the Arteries may be wanting. VII. Bauhinus, Riolanus, *and others report that these Arteries sometimes are of one side, and sometimes both in both sides are observ'd to be wanting, and this they affirm to be the cause of Barrenness.* Which thing Reason convinces us, can never be true, seeing that the Blood cannot be carried to the Stones through any other Passages, than through these Arteries; the Veins, by reason of the Obstructions of the Valves, sending no Blood to the Testicles. And so for want of Matter (which they affirm to be the cause of Barrenness, not only no Seed can be made, but neither can the Stones be supplied with Nourishment; and by that means would wast and dry up: Or else surpriz'd with a *Sphacelus* (which is an Extinction of Life and Sense, would fall down; whereas in those Bodies where one or both Bodies are said to be wanting, the Stones were found to be sufficiently swelling and juicie, and a copious Quantity of Seed conspicuous in the seminal Vessels. And therefore there must be some Deceit or Mistake in what they alledge, which proceeds from hence, which may often happen by reason of the extraordinary thinness of the Arteries, that those Arteries might be

be cut off either through the Imprudence or overhasty Dissection of the Anatomists; and so could be neither found nor demonstrated, which is the reason they readily persuade themselves and the Spectators, that they are wanting through some defect of Nature.

Spermatic Veins carry the Blood to the Vena Cava.

VIII. *The Spermatic Veins carry the Blood to the* Vena Cava, *which remains after the Nourishment of the Stones, and making the Seed.* Of these, the right Vein from the right Stone ascending the Trunk of the *Vena Cava* before, a little above the rise of the *Emulgent*, enters the *Vena Cava*; and the left enters the *Emulgent* on the same side, rarely the *Vena Cava*. *Riolanus* also writes that he has observ'd the right Vein inserted into the right *Emulgent*, which I never happened to see. Into both these *Spermatic Veins* within the *Abdomen*, several slender Branches proceeding from the Caul and *Peritonæum*, open themselves, by the Observation of *Regner de Graef*; as also that the Veins do not proceed in so streight a Line as the *Arteries*. And *Dominic de Marchettis*, *anat. c. 6.* writes that he twice or thrice saw the *Spermatic Vein*, ascending from the Stone into the *Abdomen*, divide it self in the midway into three Branches, which singly enter'd the Trunk of the *Vena Cava*.

Valves.

IX. *But least the Blood ascending through them, should slide back to the Stones, they are furnished with many semicircular Valves, like half-Moons, disposed in a double Order, and looking upwards, and so preventing the Return of the Blood.* Also at the Entrance of each into the said great Veins, there is to be seen a little Swelling, which is raised by the Valve when distended with Blood, looking toward the *Vena Cava*, as *Rolfincius* not without reason, as he believes, conjectures, and *Highmore* shews that Valve in Delineation, in the right Vein one, and double in the left.

The Progress of the Spermatic Vessels.

X. *To each Stone belongs one Artery and one Vein, and these two Vessels, more above, at their beginning about the Reins, are somewhat distant one from another, but by and by in their Progress joyn together, and are somewhat writh'd one into another, and so firmly fastened together with a Tunicle rising from the* Peritonæum, *that they can hardly be separated by Art.* *John Saltzman* tells us of three human Bodies, wherein he observed a left Artery, rising a little above the *Emulgent*, which did not presently joyn to the Vein, but first ascended upward toward the *emulgent* Vein, passed over it, and wound it self about it, and thence being presently joyn'd with the *Spermatic Vein*, descended downward after the usual manner.

The way they make.

XI. *Thus joyn'd above the Ureters they are carried down to the Groyns, where together with a slender Muscle from the Fold of the sixth Pair latent in the* Abdomen (*and sometimes another is added from the 21st. or 22d. Pair of Spinal Marrow*) *and the Cremaster or hanging Muscle, they pierce the* Peritonæum, *enter its Process, which is the Extension of the outward Membrane of the* Peritonæum *toward the* Scrotum, *forming the Sheath, wherein several Spermatic Vessels are contain'd together with the Testicle*; In which *Process* being divided into several small Branches complicated one among another with infinite Windings and Circumvolutions, they proceed to the Testicles. Nevertheless the inner Membrane of the *Peritonæum* at that same Opening or Entrance, sticks most close to the side of the Vessels: For that Membrane being broken, Burstenness follows, the Gutt, the Caul, Water and Wind falling down through the Rupture into the Production of the *Peritonæum* and the *Scrotum*. Now these Vessels aforesaid having thus reach'd the Stones, separate themselves again, and with a winding Course of the Artery quite through the whole length of the Artery, run out as far as the lesser *Protuberance* of the *Epididymis*, or winding Vessel, fix'd to the Back of the Testicles, and there again divided first into two, then into several small Branches, return partly to the opposite Extremity of the Testicle, partly lose themselves within the Substance of the Stones. But the Veins divided into very small Roots, are inserted into the little Branches of the small Arteries, and with a kind of Network are joyned together one to another; sometimes by a meer leaning and touch, sometimes by *Anastomoses*. But that here are neither observ'd nor allow'd any *Anastomoses* of the little Arteries with the slender Veins is apparent from the Injection of the Liquor into the Arteries, which never enters the Veins. Neither ought these *Anastomo-*

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ſes to be there: For if the Blood could paſs through thoſe *Anaſtomoſes* from the Arteries, nothing of it or very little would go to the Stones, but paſs to the *Vena Cava* far more ſpeedily and more eaſily by thoſe broader ways or *Anaſtomoſes*, than through the narrow and inviſible paſſages of the Stones themſelves.

The Error of the Anatomiſts.

XII. Andrew Lawrentius, Bauhinus, Veſlingius, *and many other Anatomiſts were groſly miſtaken in this, that they thought the Spermatic Artery and Vein ended in the* Paraſtate *or* Epididymis; *and there was changed into the* deferent Veſſel, *as a Body continuous to it ſelf.* Whereas it is apparent to thoſe that look more narrowly, that thoſe Veſſels do not enter the *Epididymis* or *Paraſtate*, but the Teſticle it ſelf, and that the *Paraſtate* may be there ſeparated from the Stone, thoſe Veſſels ſtill remaining whole, and adhering to the Teſticle it ſelf; For the blood enters the Stones themſelves, as *Regner de Graef*, by an ingenious Experiment apparently demonſtrates, *lib.* before cited. *That Opinion*, ſays he, *which holds that the Blood does not enter the Stones, appears to be falſe, as clearly as the noonday light, by the following Experiment. Thruſt in a ſmall Pipe into the Artery, and immit with a Syring, a Liquor tinctured with ſome Colour towards the Teſticle, and you ſhall very neatly diſcover the Progreſs of the Arteries, for that the ſame Liquor having reached the ſuperior part of the Stones, or that part where it firſt enters, diffuſes it ſelf, leaving the* Epididymiſes *untouched within the inner tunicle of the Teſticles, and runs onward toward the bottom, where while it turns again, it divides it ſelf, and as it were wantons into ſeveral ſmall Branches, which ſometimes to the Right, ſometimes to the Left, diffuſe themſelves through the very ſubſtance of the Teſticles.*

The Fold repreſenting the Form of the Tendrils of a Vine.

XIII. *Theſe Veſſels thus complicated and connexed conſtitute that Plexure, which the Anatomiſts call* Pampiniformis, *as reſembling the Tendrils of a Vine, or* Varicoſus, *from its ſimilitude to the crooked windings of the Veins: Alſo the* Pyramidal Body, *from its Shape and Figure; as being more narrow at the beginning, and multiplying as it deſcends, till it ends at the Stone with a broader Baſis. Herophylus*, as *Galen* teſtifies, calls this Fold the *Cirſoides Paraſtate*, reſembling the winding dilatation of the Veins; which Name *Rio'anus* alſo gives it. Others call it the *Variciform Paraſtate*, by reaſon of the Windings and Turnings of the Veſſels, which Name or Appellation *Veſlingius* erroneouſly attributes to the hinder part of the *Epididymis*: Whereas there are no ſuch writh'd and complicated blood-conveighing Veſſels to be ſeen in that part.

Hernia varicoſa.

XIV. *In this ſame* Fold *ſometime happens that ſort of Burſtenneſs called* Varicoſa, *when a thick and Melancholy Blood happens into thoſe* Meanders. *Hernia Carnoſa.* *Sometimes alſo a Fleſhy Burſtenneſs is here occaſioned by the bruiſing this Fold by a fall, a blow, or by hard riding*; through which Contuſion a ſpungy Fleſh grows up, and that frequently to the bigneſs of two or three Fiſts: which is rarely perfectly cured, but by cutting away the Stone of the ſide affected.

De Graef's Opinion.

XV. *However*, Regner de Graef lib. de part. Gen. Viror. *affirms, That ſuch a Complication of the ſaid Veſſels forming a Pyramidical or winding Body, is not plainly to be diſcern'd in Men, but that a Trunk of the Artery, without any Net-ſhap'd divarication runs directly to the Teſticle, and is divided into two Branches three or four fingers breadth above the Teſticles; of which, one is abſconded under the* Epididymis, *and the other proceeds forward to the Stone; of the truth of which his own Eyes have been witneſſes.* And hence he does not believe there is any ſuch Net-ſhap'd Contexture of ſmall Arteries with the little Veins; which happens otherwiſe in many Brutes, in which he confeſſes the Artery to be wreath'd into ſeveral Curles and Tendrils with the Trunk of the Vein. But the fleſhy Burſtenneſs which happens in this part, as alſo the Contexture of the Blood-bearing Veſſels, conſpicuous in the ſame place, and in the ſame manner in Men, as in many Beaſts, ſeem to evince the contrary: Unleſs it were that perhaps *Regner de Graef* would have ſaid, that altho' that ſame contexture in Brutes ſeems to conſiſt of Veins and Arteries complicated together, that the ſame in men is form'd of ſmall branches only of the Vein, returning from the Stone. Which whether it be otherwiſe in Men than in Brutes, I believe to be a very great Queſtion; the Artery croſſing it only directly. But becauſe we have not

yet so exactly observ'd it, we will leave the Question undetermin'd, till we have an opportunity to inquire more diligently into it.

No Anastomoses. XVI. *The Anastomoses of these Arteries one into another, and of the Veins with the Arteries, as unquestionable, have been described by many.* But *Regner de Graef*, by Injection of some sort of Liquor into the Artery, and several strong Arguments, affirms and proves, that there neither are any such *Anastomoses*, nor ought, nor can be.

The Office of the Vessels. XVII. *From what has been said, it is apparent, what the Arteries, what the Veins perform in reference to their use; that is to say, that the one bring blood, and the other carry back the blood that is superfluous.* Whence appears the vanity of the Opinion of *Galen*, *Bauhinus*, *Spigelius*, and several others, who extend the Office of these Vessels too far, and talk of I know not what preparation of the Blood, and alteration of the Colour to white, whereas there is no such thing perform'd in these Vessels, as appears by Inspection it self; but that the Blood is of a ruddy Colour, which is extracted out of these Veins, as well as out of other Blood-bearing Vessels, neither is there any thing of a whitish humour contain'd therein.

The Stones. XVIII. *These Vessels thus mutually connex'd together, run forward to the Stones or Testicles, which are Genital parts hanging down in the Cod or* Scrotum *without the hollowness of the* Abdomen, *ordaind for the making of Seed.* They are call'd *Testes* or Stones, because they are a testimony of Virility or Manhood; and hence it was that the *Romans* of old admitted only Men to give testimony in all Causes and Trials, rejecting those that were depriv'd of their *Testes*, as not Men.

Their number. XIX. *They are two in number, therefore by* Herophylus *call'd* δίδυμοι, *or Twins, partly for the more perfect Generation of the Seed; partly that if one should be lost or maim'd, the other might supply the place and office of both.*

The number is rarely fewer or more; in regard it seldom happens that any one is born with one Stone; tho' such accidents have happen'd: of which *Riolan*, *Borellius*, and *Regner de Graef*, produce several Examples. Very seldom also more are found in one Person, tho' it is said to be a thing familiar to some Families. And *Fernelius* tells us of a certain Family known to himself, of which all the Males had three Stones. And *Forestus*, *Borellus*, and *Regner de Graef*, and others, afford us several Examples of People that have had three Stones. But seldom of all it happens that any Man is born without any Stones, and yet perform the Act of Manhood in Copulation; yet *Cabrolius* gives us an Example.

Situation. XX. *The Stones are pendulous at the Root of the Yard, and there absconded in the* Scrotum *or Cod; seldom and preternatural it is that both should be included within the Cavity of the* Abdomen, *which nevertheless has been seen by* Regner de Graef; *to which he adds another seen by* Francis de le Boe Sylvius.

Riolanus also observ'd one to have been absconded within the *Abdomen*, in a noble Person, who nevertheless had a numerous Off-spring by his Wife. The same was also observ'd by my self in a strong Man, who nevertheless had several Children. *Paræus*, likewise *Martin Ruland* and *Bartholine*, prove by several Examples, that both Stones have lain hid for some time, either in the Groyn, or in the Cavity of the *Abdomen*, which that after the hair began to appear, fell down naturally into the Cod.

Shape and Bigness. XXI. *In shape and bigness they are like a Pigeons Egg, and sometimes a small Hen-egg, somewhat flat of each side.* Yet in both there is some variety, according as the Vessels adjoyning are more or less swell'd. Generally likewise the left exceeds in bigness the right, and hangs down somewhat lower; rarely the right is bigger than the left. Sometime in Venereal Distempers now and then one, or both, grow to an usual bigness, which afterwards when the Disease has been cur'd, I have observ'd to continue as long as the Party liv'd without any prejudice; but this is preternatural: as is also that which *Lazarus Riverius* reports, of one whose Testicles exceeded the Stones of a Horse in bigness, from which afterward fell very hard pieces of a stony Substance. And no less extraordinary is that which *Hildan* observes of a certain Person that was troubled with a Dropsie, whose right Stone being grown as big as a Goose Egg, was found stufft full of Hairs intermix'd with a purulent, oily and white matter. *Plater* likewise gives us an Example of Stones as big as a Man's head in a Person that was very bulky and fat.

Their Substance. XXII. *Their Substance is peculiar, there*

there being none like it of all the other parts of the Body, whitish and soft, consisting of innumerable very little small Ropes of the Seminal Vessels joyn'd together in a continu'd Series: in which, altho there be no manifest Concavity to be perceiv'd, yet that the said little Ropes are hollow, and conveigh the Seed invisibly, is apparent, if they be made visible. Now *Regner de Graef* was he that first taught us the way to make 'em visible to the sight: for he in a Dog, or other living Animal, tyes the *Deferent Vessel*, by which means the innermost little strings of the little Vessels of the Testicles, otherwise imperceptible, will easily become conspicuously distended, and fill with Seminal Matter. He tells us also that these Vessels appear through a whitish Tunicle full of white Seed in the Testicles of a larger *Dormouse*: he adds also, that if you put the same Testicles into Water after you have stript off the Tunicle, and stir them a little in the Water, the little Vessels of their own accord, without the help of Instruments, will separate one from another, and the whole Substance of the Testicles appear to be compos'd of nothing but small Vessels; which he had often made out to the Physicians and Surgeons of *Delph.* And the same thing he also shew'd me lately in the Stone of a *Dormouse*, which was so dissolv'd into little small whitish Vessels, that it seem'd to consist altogether of such. Tho' in the mean time it be very probable that in a living Creature there may be some peculiar, tender, marrowy Substance, with certain imperceptible Glandules, intermix'd with those Vessels, which in the washing, dissolution, and preparation of those Vessels, is separated from 'em, and disappears. For it can hardly be believ'd that the Stones should consist of little Vessels alone, supported and connected without any other Substance, seeing that in all the rest of the Bowels, Liver, Spleen, Kidneys, Brain, *&c.* the Vessels that run thorough are supported and fasten'd by the Peculiar Substance of that Bowel, and the Humours contain'd in 'em, by reason of the Property, or peculiar Temper and Formation of the Substance adjoyning to those Vessels, undergo a very great and specific Alteration, which is no more than what may probably happen, as well in the Stones as other Bowels.

The Seed-bearing Vessels extended to a great length.

XXIII. *The said Seed-bearing Vessels of the Stones being once loosen'd from each other, are to be extended to a wonderful length, requisite in those places, to that end that the Seminal matter by a longer stay, and a slower passage, being more exactly and diligently prepar'd, may attain to a greater perfection.*

They are in an Error who write that the Stones are little small Glandules, as not having neither temper, their frame or fashion, their substance nor their use; but are noble Parts that give both strength and vigour to Men. Nay, they may indeed be said to be the principal Parts, as contributing so effectually to the Procreation and Preservation of Mankind.

Vessels.

XXIV. *They receive, as has been said, very small Arteries from the Spermaticks, and send forth small Veins to the* Vena Cava *and left Emulgent.* Nerves *also they have, according to the Vulgar Opinion deriv'd from the* sixth wandring Pair, *and the* twelfth Pair *of the Breast.* In *Novemb.* 1668. and again in *Decemb.* 1670. seeking more narrowly for these *Nerves* in publick Dissections of Humane Bodies, we observ'd only one little Nerve belonging to each Stone, a little above that place where the Spermatick Vessels seem to make their *Exit* out of the *Abdomen*, which joyn'd themselves with the Spermatick Vessels, and so entering their common sheath, ran forward to the Stone, but by reason of its extraordinary slenderness, we could not well observe whether it were some little small branch of the sixth Pair of Nerves, or of the twelfth Pair of the Breast, or as others, not without reason, will have it, of the twentieth or one and twentieth Pair of the Spinal Marrow; which last seems to me most probable. And so, upon view, very few small Nerves, and perhaps but only one, seem to run out to every Stone. On the contrary, *Glisson* however has lately written that he has seen several Nerves in the Stones contributing Matter to the Generation of Seed: which great quantity of *Nerves* we could never observe in 'em; but very few, and those such as we could hardly get to reach beyond the whitish Tunicle. For they are not conspicuous in the inner Substance of the Stones, as well by reason of their extream Tenuity, as through their whitish Colour; tho' it is most certain that they give Animal Spirits to the blood that flows thither through the Arteries.

Distribution of the Vessels.

XXV. *But whether the Blood-bearing Vessels enter the Substance of*

the Stones it ſelf, or terminate in the whitiſh Tunicle, is by ſome diſputed. *Hippocrates* ſeems to be of the firſt Opinion, *Lib. de Loc. in Hom. & Lib. de Off. Nat.* where he writes that certain Veins do run to the Teſticles. Where by Veins he underſtands ſome of the blood-conveighing Veſſels, that is to ſay, Veins and Arteries. Others, by reaſon that the Ingreſs of theſe Veſſels is ſo obſcure, thought thoſe Veſſels did not enter the inner parts of the Stones; they not appearing within the Stones, but only diſſeminated through the white Tunicle. But this Doubt will vaniſh, if we look a little more narrowly into the Uſe and Formation of the Stones.

The uſe and Office of the Stones.

XXVI. *Their Uſe and Office is to make Seed, and to that end they are compos'd of a peculiar Subſtance and innumerable Seminal Veſſels wherein Seed is made.* But becauſe Matter is requiſite for the making of Seed, hence Reaſon teaches us, that of neceſſity there muſt be Blood-bearing Veſſels, and little Nerves inſerted into thoſe Seed-bearing Veſſels, for the ſupply and infuſion of matter, by degrees to be changed into Seed.

But ſome perhaps will object, that the ruddy Colour of the Blood-bearing Veſſels demonſtrates, that there is Blood in them; which Colour however is hardly ever ſeen in the ſubſtance of the Stones, and therefore no Blood-bearing Veſſels ſeem to enter that ſubſtance. I anſwer, that happens through the extraordinary thinneſs of the *Arteries*, preſſed by the white Seed-bearing Veſſels; for which reaſon in a thouſand other parts the little ſmall Arteries and Veins are imperceptible. Beſides if a Stone be newly taken out of the Body, and any ruddy Liquor be injected through a Syringe into the *Spermatic Artery*, ſeveral Blood-bearing Veſſels will ſwell up in the midſt of the Stone, and ſo become conſpicuous. *Laſtly*, I ſhall add what I have learnt by experience in Man, That is, in cutting out the Stones of vigorous and healthy Men that have been ſlain; that for the moſt part no Blood-bearing Veſſels are to be diſcovered in the inner Subſtance, no nor in the Stones of living People cut out after the Cure of Burſtenneſs; or at moſt only ſome ſmall Foot-ſteps of ſuch Veſſels appear in thoſe ſound perſons. But in Bodies emaciated by Diſeaſes, I have obſerved ſeveral ſmall Branches of Blood-bearing Veſſels ſlightly manifeſt, but very ſlender, running through the inner parts of the Stones, which we did not only ſhew privately to ſeveral young Students in Phyſick, but in *March* 1663. *November* 1668. in two Human Bodies emaciated by a long Diſtemper, ſhewed the ſame to divers Spectators publickly in our Anatomy Theater. The cauſe of which ſeems to be this: For that as there is in the Brain a peculiar Specific power, by vertue of which Animal Spirits are made of the Blood in its Veſſels, Fibres and Pores, ſo alſo there is in the Teſticles a peculiar Seminifick Power, by vertue of which the Blood being carried into their *Vaſa Sanguifera*, is altered into Seed. Now this active Power being ſtrong and vigorous in ſound People; hence the more ſubtile and more ſalt Particles of the Blood, carried through the little Arteries to their more inward parts, together with the Animal Spirits coming through the Nerves, fall into thoſe Plexures or labyrinth-like, and moſt wonderfully interwoven *Vaſa Sanguifera*, and being there received by them loſe their ruddy Colour, as the *Chylus* loſes its white Colour in the Heart, and is changed into white Seed, But as for that ſmall remainder of Blood remaining in the *Vaſa Sanguifera*, it is ſo obſcur'd and diſcolour'd by the whiteneſs of the ſubſtance of the Stones, and the ſaid *Vaſa Sanguifera*, that it is not preceptible to the ſight. But in ſickly People whoſe Stones as well as other bowels are weak, the ſeparation of thoſe Particles of blood which are neceſſary for the making of Seed, is neither well perform'd, nor with ſufficient ſpeed, for which reaſon the Sanguiferous Veſſels are more tumid, and containing more blood than ordinary, and more viſible to the Sight. Moreover at the ſame time the ill ſeparated, and over ruddy Particles of the blood, being affuſed into the Seminiferous Veſſels, are but ill and ſlowly concocted, and altered into Seed therein, and therefore the Sanguine red Colour appears in ſome meaſure here and there in theſe Veſſels. For the ſame cauſe it alſo happens, that in thoſe that are too frequent in Copulation, there is ſometimes an Ejection of blood inſtead of Seed; the Stones being ſo debilitated by frequent Venery, and over much ſpending of the Seed, that the convenient Particles of blood flowing into thoſe Veſſels, cannot ſo ſoon be ſeparated from the reſt, nor changed into blood; Now the forementioned Power proceeds from an apt, convenient and proper formation and temper of the Stones, which temper being either altered or weakned by Diſeaſes, or over-

much

much use of Women, they also suffer in their Seminific Power: as for the same reason the Power of making Spirits is weaken'd in the Brain.

A Question, How the Separation of various Particles from the Blood are made?

XXVII. *Here a great question arises, How the more salt Particles of the Arterial Blood infus'd into the Stones, and most apt for Generation, and the watery or white Particles come to be separated from the red Particles?* Which is a thing so dubious, so obscure and intricate, that never any Man as yet durst go about to unfold it: or at least they who durst attempt to say any thing, flying to peculiarity of Substance and Pores, seem to have hardly said any thing at all. In the preceding 14 Chapter we have told ye, how that in the Liver the Separation of Humours to be segregated from the rest of the sanguin Humours, is performed by small invisible Glaudulous Balls, formerly unknown, but in our times discovered by the diligence of *Malpigius*, with the help of his Microscopes. Also *c.* 18. We have likewise shewn ye, that the blood passing through the Ash-coloured Substance of the Brain, in that passage, by reason of the peculiar property of its Glandulous Substance, and its Pores, loses its most subtil and spirituous saltish Particles, which being imbibed by the beginning and roots of the small Nerves, are there by degrees more and more rarified and attenuated and exalted to a more refin'd Spirituosity, while the other ruddy and more Sulphury Particles are sucked up by the more small Veins, and so by degrees return to the Heart. And thus it seems probable, that the same Operation is perform'd in the Stones. * For *either* some very small, and hitherto by reason of their extraordinary Exility, invisible Kernels, or Glandulous Balls are intermix'd and scattered among the small Vessels of the Testicles, by means of which such a necessary Separation is made: Or *else* there is a certain white marrowy peculiar substance surrounding the small Vessels of the Testicles, of which the Stones chiefly consist, into which Substance the Arterious Blood being infused, loses in its passage, the most subtil saltish Particles, of which the Seed chiefly consists, most apt for the generation of Seed, to be thereupon suckt up by the peculiar *Vasa seminifera* of the Testicles, and more exactly to be prepared, while the other Particles entring the Orifices of the small and imperceptible Veins, return to the *Spermatick Veins*, and so farther to the Heart. But which of these ways is to be asserted, or whether any other third way is to be determin'd upon, we shall leave to them, who by a more accurate Inspection, or by the help of *Microscopes*, shall be able to make a clear discovery. In the mean time there must be something certain and assur'd of necessity, by means of which the aforesaid Separation is to be performed. For otherwise, if by Transfusion alone the blood should immediately flow out of the Arteries into the Seminal Vessels, there would be no reason why it should not all be converted into Seed, but that some part of it should return through the little Veins to the Heart; and moreover, why its red Colour should not always appear in the said Vessels.

** How Nature performs this Operation we have demonstratively shewn in our* Synopsis Medicinæ, *lib. 4. cap. 8. Sect. 10. §. 14. ad 36. to which I shall refer you.* Salmon.

Lymphatic Vessels observed in the Testicles.

XXVIII. *Besides the Vessels already mentioned, by more accurate Inspection of Anatomists, and that not so lately neither, many Lymphatick Vessels have bin observed, arising within the Tunicles of the Testicles, meeting one another with several* Anastomoses, *and ascending with the* deferent Vessels *upward into the* Abdomen, *and there emptying their* Lymphatic *juice into the* Vasa Chylifera. They are furnish'd with several Valves looking upward, preventing the falling back into the Testicles of the Lymphatic juice, ascending from the Testicles. These little Vessels are easily visible to the Eyes of the Beholders, if the *Vasa Sanguifera* be but ty'd a little above the Stones, and then the Stones be but stirr'd, for then these *Vasa Lymphatica* shall be observ'd to swell between those ty'd Vessels, as is daily to be experimented in living Animals, and human Bodies that have not bin long dead. Now because there is a correspondence between all the Lymphatick Vessels and the Glandules, and that their Original is deriv'd from them; hence because they arise from the inner Substance of the Testicles, that is mainly confirm'd which I spoke before, of the invisible Glandules intermingl'd among the Vessels of the Testicles, and separating a Salsuginous matter proper for the Generation of the Seed from the Arterial Blood.

The Tunicle called Albugineous.

XXIX. *A strong, thick, hard, slender proper Tunicle is the first Covering that involves the substance of the Stones, called the White or Nervous Tunicle, which being a little rough withinside, sticks every way close to it,*

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and binds it together, being somewhat soft, for fear of being broken. Without-side it is somewhat moist, and bedew'd with a watery Humour, and rather in the Extremities than in the Middle, has the Epididymis's *clinging to it.* By means of this Tunicle, the *Vasa Sanguifera*, together with the Nerves that penetrate it on every side, more safely reach to the innermost parts of the Stone, and the Lymphatic Vessels more conveniently spring out of 'em.

The Vaginal Tunicle.

XXX. *Round about this, for its better defence, is enwrapt another strong and slender Tunicle like a sheath, and therefore call'd* ἐλυτροειδὴς, *or the* Vaginal Tunicle, *which is form'd by the Process of the outward Membrane of the* Peritonæum. *Riolanus* writes that this Tunicle again is enfolded by another slender and red Tunicle springing from the *Cremaster* dilated. But in regard it is nothing but the *Cremaster Muscle* dilated, it cannot well be taken for any peculiar Membrane enfolding the Stone.

The Muscles.

XXXI. *The Stones are furnish'd with two Muscles, call'd* κρεμαστῆρες, *or* hanging Muscles; *of which each Stone has one, which both together arise from the Spine of the Share-bone, or as* Riolanus *will rather have it from the fleshy extremity of the Oblique ascending Muscle; slender, smooth within, and bedew'd with a watery Humour; without-side rough and fibrous, with their fleshy Fibres encompass outwardly almost the whole Process of the* Peritonæum, *especially the hinder part, and so hold up the hanging pendulous Stones;* and in Copulation bring 'em upward, that while the Seminary Vessels are evacuated, presently the Seminal Chanels being abbreviated, and the Stones moderately compressed with the *Parastates*, new Seed may be carried more easily and speedily into the emptied Vessels.

The Cod, call'd Scrotum.

XXXII. *The Testicles thus fortified and cloath'd, hang forth without the* Abdomen, *in a Purse or soft wrinkled little Bag, call'd by the Latines* Scrotum *and* Scortum, *by the Greeks* ὄσχεον *and* ὀσχὸς, *which by a middle Line or Seam being divided into the right and left part, and interwoven with several Vessels, is form'd out of a Cuticle, and a more soft and slender Skin; and within another slender Tunicle adheres to it, rising out of the fleshy Pannicle, call'd* διάφραγμα, *which cleaves to the Vaginal Tunicle with many membranous Fibres. Regner de Graef* writes that he knew a Man, who by virtue of this Tunicle (for it could not be done by the Skin, drew up his *Scrotum*, as he listed himself, and caus'd a Motion in it, at the request of the standers by at any time, not unlike the Peristaltic or crawling Motion of the Entrails. But because voluntary Motions are only perform'd by the Muscles, I am apt to believe that the *Cremaster Muscles* in that Person stuck to the Tunicle; which Muscles are in some men so strong, that they will move their Testicles and the *Scrotum* too, if adhering to them, as they please themselves. But there is no Fat between either Tunicle of the *Scrotum*, which would be but a burden and impediment to the part.

Signs of Health.

XXXIII. *Some Symptoms of health or sickness are wont to be taken from the* Scrotum. For as a *Scrotum* wrinkled and contracted is a sign of sane health, so a relax'd *Scrotum* is frequently a sign of weakness, provided such a relaxation proceed not from any External Cause; by which sign Nurses and Women judge of the health of Infants.

The Seed flows from the Testicles through the Deferent Vessels.

XXXIV. *The Seed being prepared and made in the Stones, flows from thence through the* Vasa deferentia *toward the seminal Vesicle. But which way it comes out of the Stones into the* Parastates *does not so manifestly appear:* For as the Entrance of the *Vasa Sanguifera* into the Substance of the Testicles is very obscure, so the way through which the Seed flows out of the Stones into the *Parastatæ* is hardly perceptible to the Eye, which is the reason Anatomists do not agree in describing it. *Highmore* writes that in the middle of the Stone he found a certain Body round, white and thick, not unlike the *Vasa deferentia* extended from the bottom of the Stones to the upper Part, and strongly inserted into the inner part of the *Albuginous* Tunicle, and penetrating the Tunicle, and thrusting itself into the Head of the *Parastatæ*. That same whitish Body appeared likewise to me long before I saw *Highmore*'s Writings, into which all the winding Fibres of the Testicles seem'd to throw themselves, but I durst not assert it to be the *Ductus* that conveigh'd the Seed to the *Parastatæ*; because I could not perceive any Concavity in it. I saw sufficiently that same strong ingrafting of

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it into the Inner part of the white Tunicle of which *Highmore* speaks; but I could not discern the Perforation of the Tunicle by that white Body; and therefore I thought it ordain'd for some other use, that is to say, to the end that together with other crooked Fibres annexed to it, it might serve to strengthen the Vessels, as well those that enter the Testicle, as those that are therein contain'd; and thence they hasten'd towards the outward parts of the Testicle to the *Epididymis*, to prevent a Confusion of all the Parts together: In like manner as in the Inside of an Orange or Citron, certain whitish harder Bodys are observ'd, by which the Vessels that convey the Juice and the Vesicles containing the Seed are fortify'd and upheld. *Spigelius* has another Conceit as concerning this very thing: For he says that between the Stones and the *Parastates*, at the upper part where they are joyned together, several slender Vessels pass thorough. In like manner *Riolanus* also writes, that there is a small Hole to be found through which the seminal Humour enters the Substance of the Stones, and other three little Branches that run out from the Stone into the *Vas deferens*. These learned Men seem to have seen something as it were thorough a Cloud, and to have added every one a Chip of their own, according to their own Conjectures. But *Regner de Graef*, through his singular Diligence has illustrated all these Incertainties and made 'em much more perspicuous, who has observed these things of the Egress of the *Vasa Seminifera*. *We have clearly seen*, saith he, *their Egress out of the Stone, and have found it to be quite otherwise than* Highmore *has described it to Us. For they do not go forth from the Testicle with one thick Channel, but in many Animals with six or seven slender Channels, each of which being bent from side to side, from the bigger Globe of the* Epididymis; *and meeting together therein with one single Channel run forth to the seminary Vessels.* He adds that those slender Channels, while they break forth through the *Albuginous* Tunicle, can hardly be seen but when they are swoll'n with Seed.

The Parastatæ. XXXV. *The Seed therefore flows out of the Stones into the* Parastatæ, *so call'd because they stand by or are attendant upon the Stones, and being variously writhed and contorted like those crooked Windings of the Veins call'd* Varix's, *are by the Greeks called* Ἐπιδιδυμίδες, *because they stick to the Stones, and as it were lye upon 'em.* Now the *Parastatæ* or *Epididymidæ*, (for by both Names we design the same thing, notwithstanding the Distinction of *Riolanus*) are two white, somewhat hard, oblong Bodies, of which one lies upon each Testicle while they are as yet wrapt up, but still in the *Albuginous* Tunicle, and is infolded in the Tunicle common to the Spermatic Vessels, and toward both Extreams of both Testicles is most closely fasten'd to the *Albuginous* Tunicle, but in the middle sticks but loosely to it and is easily parted.

The Beginning. XXXVI. *The beginning of these* Parastates *rises up somewhat swelling in that place where the Varicose Body approaches to the Stone; to which it adheres so close that many Anatomists, have formerly thought that that same Body did not enter the Stones but the* Parastates, *and questioned by which way the Blood should come to the Stones.* This Beginning is somewhat hard, furnished with no manifest Hollowness, but arising with six or seven Roots from the Stone.

The Progress. XXXVII. *In their Progress the* Parastates *descending to the lowermost Parts of the Stone, are for the most part of an equal Figure and Shape, and are folded and twisted together with several serpentine Courses or Windings, and contain a white Seed. Then turning upward again with a wrinkled and somewhat swelling circular Progress, after their Reflexion; they are freed from their closer Connexion to the Stones, and only rest upon their Tunicle, and go forth into one Passage continuous to the* Vasa deferentia. From which Vessel they differ no otherwise, only that this proceeds with a straight Course, and they with many Windings and Turnings, and also by reason of their thinness are somewhat softer.

Their Substance. XXXVIII. Vesalius *ascribes to 'em a Nervous Substance*, Fallopius *a Glandulous. But* Regner de Graef *has lately taught us that neither is true: Who by a singular Dexterity untwisted the winding and folded Body of each* Parastate, *by warily cutting first the exterior, then the second Membrane; and so extended this*

this Body into a prodigious Length, which he writes did apparently appear in an ordinary Creature to exceed the length of five Ells, and to be one entire Vessel containing Seed, straiten'd in its Situation by lateral Contorsions to and again twisted one upon another. He adds moreover, that at the upper part of the Stones, in its Original it is so slender, that it may be compared to a small Thread, but by degrees it grows so thick, that being increased to the bigness of a small Packthread, at length it makes the Vessel that carries the Seed: And from hence he also believes that the Stones differ no otherwise from the *Parastates*, only that the former consist of sundry minute Vessels, the latter for the most part of one Channel or thicker Vessel, and that the *Parastates* differ from the *Vasa deferentia* only in this, that the latter proceed with a right Course, the former with many Oblique or Windings and Turnings, and are somewhat softer by reason of their extream Thinness. From which Experiment it is abundantly apparent, that there is nothing of a glandulous Substance in the *Parastates*, nor any thing of nervous, as having a conspicuous Cavity containing Seed apparent to acute Eyes, which is not to be found in Nerves. But it is necessary that the Seed being concocted in the Stones should pass through those serpentine Windings, to the end it may by a longer Delay and a slower Passage, not only be better elaborated but acquire a greater Perfection.

The Function.

XXXIX. *As to the Use of these Parts, it is erroneously described by* Spigelius, *who attributes a seminific Power only to the* Parastates, *excluding the Stones from that Office, which he will have only to collect the serous Excrements of that Concoction, because that in the Stones there is no Seed, but only a serous Humour to be found.* *Dominic de Marchettis*, because there does not seem to be any Hole manifest to the Eye, through which the Seed made in the Stones, may be emptyed out of 'em again, concludes from thence, that the Stones were only made to cherish the *Epididymises* with their Heat for the more easy and speedy Alteration of the Blood into Seed in those Vessels. But the former tells us no reason wherefore Nature should ordain a greater Part for the separation of Excrement, and less part for the seminific Action. Neither does he shew through what ways those collected Excrements are again evacuated out of the Stones. Nor does the *Latter* make it appear, how the Stones, which are the colder Parts, should cherish the *Epididymises* with their Heat. But they both seem to have fallen into the same Error with many others, for that they were both of Opinion that the Arteries and spermatic Veins did enter the *Parastates* and not the Stones, which Vessels, seeing they enter the Stones themselves and not the *Parastates*, it is sufficiently apparent that the spirituous Seed being made in the Stones, and from thence ascending thorough Vessels hardly perceptible, is yet farther prepared, and by a long and winding Labyrinth gains a greater Perfection, and so by degrees is poured forth into the *Vasa deferentia.*

Other Opinions.

Vasa deferentia.

XL. *Now the* Vasa deferentia, *deferent or ejaculating Vessels are two white Bodies, somewhat hard, round, in some measure like a bigger sort of Nerve, extended from the* Parastates *to the seminary Vesicles porous within, without any seeming conspicuous Hollowness.* And yet *Regner de Graef*, a most perspicacious Enquirer into the Mysteries of these Parts, gives us some farther Proof of this Hollowness, in these Words. *The* Vas deferens, says he, *is endu'd with a manifest Hollowness; which that it may be discerned, this Vessel is to be opened six or seven Fingers breadth above the Testicle; then force the Breath blown in, or the coloured Liquor syring'd into it toward the Testicle, and you shall find the Vessel distended, and discern the coloured Liquor through the middle of it run in a right Channel to the Stone. Then you shall perceive the Cavity in the Vessel it self rowle from side to side, and lastly to be bow'd by degrees with the Vessel, in the same manner as Serpents and Eeles when they strive to creep with more than usual Swiftness, and so with Windings, not circular, but Sideways, runs on to the Bodies of the Testicles.* Thus its Hollowness appears toward the Stones, now how it may be observed toward the seminary Vesicles, he tells us a little after. *This*, says he, *if ye desire to know clearly and distinctly, thrust only a little Pipe into the* Vas deferens, *which being distended either by blowing into it or injection of some Liquor, you shall observe those seminary Vesicles to be speedily distended before any thing breaks*

breaks forth into the Urethra. *Hence appears their Error, who affirm that the* Vasa semen deferentia, *or Vessels that carry the Seed, have no Communion with the seminary Vesicles, as being absolutely different from 'em, and that they evacuate themselves through two peculiar Holes into the* Urethra, *distinct from those through which the seminal Matter breaks forth from the Vessels.*

Other Opinions. LXI. John Swammerdam, *sharply reproves this last Experiment of* Regner de Graef, *and asserts for a certain that the* Vesiculæ Seminariæ, *or seminary Vesicles have no Communion with the* Vasa deferentia, *nor receive any Moisture from 'em; and for the more solid Proof of this, he tells us of a seminal Vesicle that he has at home, inserted in three distinct Places in the* Vasa deferentia. This Argument *Regner de Graef* derides, and in Opposition, bids him shew more than ten seminal Vesicles wherein he can demonstrate that the seminal Vesicles do not terminate in the *Vasa deferentia*, but the *Vasa deferentia* in them. *John Van Horn*, sway'd by the Opinion of *Swammerdam*, writes that the Seed breaks forth through peculiar Holes out of the *Vasa deferentia*, but through other Holes out of the Vesicles into the *Urethra*. But *Swammerdam* rejects this Opinion of *Horn*, saying that it is only true in Bulls, and not in Men, in whom the Vesicles have an Exit into the *Vasa deferentia* in three distinct Places, but no other Communication with 'em. But I am of Opinion, that that same threefold Egress of the Vesicles into the *Vasa deferentia*, assign'd 'em by *Swammerdam*, is rather the Entrance of the said *Vasa deferentia* into the Vesicles, through which the Seed flows out of the one into the other. For in the Dissections of human Bodies we manifestly find, that the seminary Vesicles being squeez'd by the Finger, the Seed does not break forth out of them into the *Vasa deferentia* through those three distinct Openings, but in the same place into the *Urethra*. Which is a certain Demonstration, that the Seed flows forth through those three Orifices into the Vesicles, but does not flow out of 'em again the same way. *Lastly*, After he has said all, *Swammerdam* concludes, that there is a fourfold Matter, out of which the Seed is made. One out of the Testicles; a Second, from the Ends of the *Vasa deferentia*; a Third, out of the seminary Vesicles; a Fourth, proceeding from the *Parastates*. But, in regard that Entities are not to be multiplied without Necessity, I know not why so many Matters of one Seed, and so many Parts should be alledg'd for the Preparation of those several Matters. No Man, I suppose, will deny, but that the Seed is compounded of Arterial Blood, and Animal Spirits, and seeing that Spermatic Arteries, together with small Nerves, are carried into the Testicles, and that there is no Progress of either to the *Vasa deferentia*, the Vesicles or *Parastates* any where to be separately discern'd, it seems more likely, that there is but one seminal Matter, that is to say, Arterial Blood, conjoyn'd with animal Spirits, which is altered and concocted into true Seed in that wonderful Contexture of the Vessels of which the Stones consist, and which flowing from them through the *Parastates*, and *Vasa deferentia*, in those Windings and Turnings gains something to its greater Perfection, by which means it may be preserv'd in the seminary Vessels untainted, till the time of necessary Evacuation. And hence it is that the Experiment of *Regner de Graef*, seems more consonant to Reason; by which the Communication of the *Vasa deferentia* with the Vesicles is confirm'd, than that of *Horn* and *Swammerdam*, by which it is opposed. For as they produce the Testimony of Ocular View, so does he, but where Ocular View is deficient, there Reason is to be call'd to our Assistance, and she is to determine concerning the Truth of the Matter. And this Example may help us; for as Spirit of Wine being so thin and subtil, that ascending the Alembic, it becomes Invisible, and cannot be embody'd till descending from thence through the Serpentine Brass Tube set in cold Water, it attains such a Perfection of Condensation, that it flows down into the Receptacle to be preserv'd for Use. In like manner the several Windings and Meanders of the *Vasa deferentia*, serve to concoct and thicken the Seed, afore it fall into the seminary Vessels. Moreover as Nature in our Bodies appoints one Part to make the *Chylus*, which *Chylus* flowing through the long Meanders of the Intestines, acquires therein a great Purity, and Separation from feculent Matter; tho' the Intestines themselves conduce nothing to the making of the *Chylus* it self: So is it in all the spermatic vessels, which singly make no particular Matter conducing to the Compo-

sition of the Seed, but only the Stones alter the first Matter into Seed, * which in its Passage through the other Parts gains some greater Perfection, and after Disposition to be preserv'd without Corruption for Use.

* *That is to say, the Lymphatic Matter, Humour or Aqueous Juice, call it by what Name you please, which is separated from the Blood, and sent by the* Vasa spermatica *into the Testicles, is there by their own proper* Fermentum *converted into Seed, as we have formerly declared concerning the Generation of other Juices destinated to particular Ends according to the Nature of the Parts and Necessities enforcing the same. As our Author even in this place declares in so many Words, to wit,* That it is done by a specific Fermentation of Humour in some specific Part or Bowel, without which it could not be made: *the reason of which he renders immediately, for that the said Bowels, when weak or enfeebled, are not then able to prepare those new Juices.* Salmon.

Lastly, That some new Humour or Juice, as *Chylus*, *Blood*, *Choler*, *&c.* may be made, it is not brought to pass by a bare Confusion of various Matters, but by a specific Fermentation of the Humours in some specific Part or Bowel, without which no other new Juice or Humour can be made of no Humours, as is apparent when those Bowels are become weak and enfeebled by any unsound Constitution; for then they are not able to prepare those new Juices. But now if the most noble Seed, which contains in it self a Compendium of entire Man, should be composed out of those four Matters flowing and mixing together in the Ureter from several Parts, as *Swammerdam* believes, then a new seminal Liquor would be made out of those four Matters simply mix'd and confus'd, without any other peculiar Concoction of those four Matters so confused, appointed and precedent in any other design'd Part or Bowel which is contrary to the Custom of Nature and Reason. In the last place I would desire *Swammerdam* to tell me, whether that Matter by him call'd the *Second* distilling from the Ends of the *Vasa deferentia*, be divers and distinct from that first Matter which flows from the Stones; and if it be different or distinct, as he will have it to be, from whence those *Vasa deferentia* receive their Matter, unless it be from the Stones and their *Parastates*, when no other small vessels open into their Cavities. But to the Business.

Their Progress. XLII. *One of the* Vasa deferentia *rises out of the* Parastate *of each Stone, and creeping upward through the Proces of the* Peritonæum, *enters the* Abdomen *the same way through which the spermatic Vessels descend toward the Stone.* Now when both are entered the *Abdomen*, by and by they are divided above the *Ureters*, and with a reflexed Course run along to the hinder Region of the Bladder, and above the right Gut, near the Neck of the Bladder, before they meet together again, are dilated and made thicker, and much about the Sides of that *meeting together*, stick to the seminary Vessels, into which they open and discharge their Seed, and thence united together, both of 'em vanish in the *Prostatæ* of its own Side.

Seminal Vessels. XLIII. *The Seminary or Seminal Vessels are as it were little Cells disposed in Clusters, collecting and preserving the Seed flowing from the Stones to the* Vasa deferentia; *of which they contain a great Quantity*, till being troublesom either in Quantity or Quality, or else in Copulation, it be squeez'd out, by the Swelling of the Muscles of the Yard, and neighbouring Parts compressing the Vesicles, through the same narrow Passage through which it fell into the Vesicles; and by the same Compression be thrust forward toward the *Ureter*, through two most narrow Chanels crossing through the middle of the *Prostates*, and so comes to be evacuated into it, through two very small Holes, through which, the Vessels being pressed by the Finger, the Seed in dead Bodies is observed to pass through in small Drops, like Quicksilver strained through a piece of Leather. Here *Swammerdam* notes that in *Moles* the seminal Vesicles, which in those Creatures are very large, have their particular Muscles with which they are girded about; but we could never observe any such Muscles in Men. Neither let any Man think it a strange or unusual thing, that any Humour should flow in or out of any Part the same way; for in this case there is a double Motion to be considered; the one ordinary ordain'd by Nature, acting spontaneously, by which the Seed flows out of the *Vasa deferentia* into the said Vesicles: Another caused by the force of Compression, by which Motion the Vesicles being compressed, the Seed is squeez'd forward toward the *Urethra*, through the same Hole it fell in, and is evacuated into it; which Motion is to be called violent, whether it be done willingly, or by a strong and sharp Provocation unwillingly.

Some tho' erroneously attribute to these Vessels the Office not only of collecting,

lecting, but of making the Seed; seeing that the thinness of their Substance renders 'em uncapable for such a duty, and for that the Seed is already perfectly concocted and finished in the *Parastates* and *Vasa Deferentia*.

Their Substance. XLIV. *They consist of a thin Membrane, furnish'd with little Arteries, Veins and Nerves, with which some think the Lymphatic Vessels to be intermix'd.*

Bigness. XLV. *In length they hardly exceed three Fingers breadth, in breadth and thickness equalling the breadth of one finger; but for the most part somewhat bigger in the one than the other side.*

Situation. XLVI. *They are seated on both sides at the Ligaments of the Piss-bladder and right Gut, at the sides near the meeting of the* Vasa Deferentia, *a little before their meeting, and adhere very close to the* Prostates.

Number. XLVII. *They are double, divided one from another by a kind of Space, and both emit the Seed into the* Urethra *through several Chanels, and a peculiar hole for the continual supply of Generation; so that if those in one side should be damnified by Stone, Cutting, or any other Accident, the others being whole in the other side, may be sufficient to supply the office of Generation*; as we hear and see with one Ear or Eye, when the Action ceases in the other.

Their Cavities. XLVIII. *Cavities they have, not only one, but full of windings, and compos'd of several Cells, dispos'd in Clusters, exactly representing the little Cells in the Glandules of a* Pomegranate, *to prevent the whole Mass of Seed from being wasted in one Act of Copulation:* but that the Windings and Meanders should be able to reserve enough to serve for several Acts of Coition.

Whether any Valve. XLIX. *To these obscure Passages through which the Seed flows into the* Urethra, *some Anatomists affix a little piece of Flesh; and* Vesslingius *thinks there is a Valve to prevent the continual Efflux of Seed.* But certainly there is no need of it in this place, seeing that the narrowness of almost invisible Passages is sufficient to contain the Seed: Besides, that in healthy People it cannot flow out without a Compression of the Vesicles; which being once compress'd (whether it be by Plenty of Seed, or too much heat, or Acrimony thereof, which causes a Titillation of the adjoyning Parts, which provokes them to a Contraction, and consequently to a Compression of the Vessels) it must of necessity flow out, and cannot be hinder'd by any Valve. *Riolanus* better observes that in young Lads, till twenty years of Age, that never were troubled with the *Gonorrhea*, there is a Membrane wrapt about like a Valve, so plac'd, as not to hinder the Efflux of the Seed out of the Vessels, but the flowing of it into the Piss-bladder. But 'tis a wonder that *Riolanus* should allow this Valve or Membrane only to young Lads, seeing it is to be discern'd in elder People, if not corroded by the Acrimony of the Seed in a *Gonorrhea*, and is also often broken with great pain in elderly People by the Immission of a *Catheter*.

The Cause of the Gonorrhea. L. *These obscure Passages from the Vesicles to the* Urethra, *if they be corroded away by the Acrimony of the Seed (which Acrimony is contracted by unclean Venery) or if debiliated or dilated of themselves, they become over loose in that part (which we have observ'd in old men too much using Copulation) then follows a* Gonorrhea. And in this manner both *Vesalius* and *Spigelius* have observ'd those Passages very much dilated in Persons that have dy'd of a *Gonorrhea*.

Galen and *Highmore* tell us of a certain oily Humour which is pour'd forth out of these Vessels, to smooth and make slippery the Passage of the *Urethra*, lest it should be injur'd by the Acrimony of the Urine or Seed. But for my part, I could never squeez any thing out of these Vesicles than only Seed; and therefore I believe it to be a thing beyond all doubt, that there is nothing but Seed contain'd in those Vessels, and that the slipperiness of the *Urethra* does not arise from any oily Humour flowing from the Vesicles, but from some slimy part of the Nourishment of the *Urethra*, with which that innermost passage is besmear'd, which is the reason also of the slipperiness of the Piss-bladder, Guts, and several other Parts.

The Prostates. LI. *Adjoyning to the Urinary Vesicles stand the* Prostates, *which are two Bodies, but so close joyn'd together, that they seem to constitute one Body; they are glandulous, somewhat hard,*

whitish, and spungy; flat before and behind, round on the sides, and are wrapt about with a thick Fibrous and strong Membrane, rising from the Vasa Deferentia, *and the lower part of the Bladder, and closely joyn'd to the Piss-bladder at the Root of the Yard.*

The bigness LII. *They are about the bigness of a Walnut, but bigger or less according to the salaciousness of the Party, or the more frequent use of Copulation.*

Their Vessels. LIII. *They are also furnish'd with some few Nerves, as also Veins and Arteries, chiefly conspicuous in the External Tunicle.*

Their Liquor. LIV. *These* Prostates, *tho' at first sight they seem hardly to contain any Juice, nor to have any Commerce with the* Vasa Deferentia, *yet in People extreamly Letcherous, that have dy'd presently after Coition, they appear swelling with a slimy Liquor, and many little Vesicles are to be found full of that limpid slimy Liquor, which being compress'd flows into the* Urethra *by the way of the Seed.*

The passage of this Liquor. LV. *But* Regner de Graef *has observ'd this slimy Liquor to be carried through many Chanels absconded in the inner Body of the* Prostates: *and at length meeting all together.*

In the innermost hollowness of it, says he, *several Passages appear, all which, as many as there are, at the sides of a large little piece of Flesh, evacuate themselves into the* Urethra. *The Orifices of these are stop'd up with certain small bits of Flesh, lest the Matter made in the Glandulous Body should flow forth at other times than in Copulation, or least the Urine should flow into their Body through those Passages.*

How they may be discerned. LVI. *Then he adds a way how these Passages may be discern'd.*

They, says he, *who are so curious as to examin these Passages any farther; let 'em first squeez out their natural Liquor, and then swell 'em up with a hollow Straw, at what time being distended with the breath, they will display their Ramifications apparently, at the sides of which little Cells about the bigness of a Mustard-seed distinctly appear, which when the Passages are blown up, swell together, so that at first sight you would take the whole Substance of this Body to be spungy, and to consist of several round oblong, and several other figur'd Vessels. Now as to the number of the describ'd Vessels that terminate in the* Urethra, *it is not always the same in all Bodies. Yet we never observ'd less than ten in a Man: In Dogs we have numbred sometimes ninety and more, through which this serous Matter flow'd out of this glandulous Body, being compress'd. That which is most remarkable in these Chanels, is this, That there is no such communication of 'em one with another, by means whereof the Wind should burst out of one Chanel into another; for that they are so distinct one from another, that one Chanel being blown up, only some part of the glandulous Body is extended; and the other Chanel being puff'd up, the other part swells; so that the Substance of the glandulous Body may be distinguish'd into so many Divisions as there are Chanels to be found in it.* And thus has *Regner de Graef* by his singular industry egregiously discover'd the great Mystery of the *Prostatæ* hitherto unknown.

Its Muscle. LVII. Riolanus *observes that the Sphincter Muscle of the Bladder, orbicular, fleshy, two fingers broad, envelops the* Prostatæ, *and that it is in that place separated from the Substance of the Bladder, the* Prostatæ *lying between; and thence it happens that when they are press'd by the Sphincter, the Seminal Liquor is squeez'd out of 'em: and that at the same time by the same Compression the Bladder is clos'd to prevent the Urine from flowing out with the Seed.* But in regard the Seed does not flow out of the *Prostates* only into the *Urethra*, but out of the Seminal Vessels chiefly, *Riolanus* ought rather to have said, that the *Prostates* and Seminary Vesicles are compress'd together by that same constraint of the *Sphincter*, and so the Seminal Liquor, together with the Seed collected in the Vessels, is at the same time sent from them to the *Urethra*. *Lindan* here asserts two Muscles, of which he calls the inmost the *Sphincter*, the other the *Fascial* or Plaistred; about two fingers broad, wrapt about the neck of the Bladder, and the *Prostates* resting upon the *Glandules*. Upon which, as he says, depends the power of opening or shutting those parts. But in regard that *Lindan* has only describ'd these Muscles from his own Speculative Contemplation, never demonstratively shewn 'em, we think it but reasonable to question the Truth of 'em till farther Confirmation.

LVIII.

The form of the Prostatæ.

LVIII. *The* Prostatæ *in the middle of the upper part, seem to be somewhat hollow'd like a Funnel, and there it is that they admit the Passages of the Seminal Vesicles penetrating through the middle of 'em, which being taper'd at this Entrance, run along very small to the* Urethra, *into which they are open'd with a very slender* Exit.

They are indu'd with an acute Sense.

LIX. *These* Prostatæ, *as also the Stones, are endued with a most acute sense, and much conduce to the pleasure of Copulation.* But we are to talk with some distinction, when we speak of the exact sense of these, and of the Stones; for the acute sense is only in the outward Membrane involving these Parts; for in the Substance it self there is very little or no feeling: For tho' both *Glisson* and *Wharton* attribute many Nerves to the *Prostates* and Stones, for my part I could never observe but very few, and those very small which are carried thither, and that those are chiefly dispers'd through the infolding Tunicle.

Their Use.

LX. *The use of the* Prostates *is somewhat disputed. Some think it probable that they add some greater perfection to the Seed which is made in the Stones, and render it more fruitful. Which Opinion, however displeases others, by reason of the small Commerce which they say there is between the Vessels preserving the Seed and the* Prostates. But this small Commerce *Regner de Graef* endeavours to prove: *For,* says he, *the Piss-bladder being taken away in the middle, according to its length, let the glandulous Body be dissected* (so he always calls the *Prostates*) *and the Chanels of the* Vasa Deferentia *and Vesicles be closely pursu'd to their* Exit *into the* Urethra, *and be separated from the glandulous Body, then putting a little Pipe into the Vessels carrying the Seed, if any Liquor be forc'd into their Cavity by the help of a Syringe, the Seminal Vessels swell with the Deferents themselves, the Liquor flowing strongly through the Hole into the* Urethra, *which if they be stopped about their Exit into the* Urethra, *nothing bursts forth out of the Chanels in that place where they are annexed to the glandulous Bodies, tho' the Seminary Vessels be forcibly distended; which would necessarily happen, had they a mutual Commerce with the glandulous Body.*

Hence *Regner de Graef* infers that there is neither any Seed generated in 'em, nor any thing Seminal contain'd in 'em; but believes that what is therein contain'd, is something peculiar, some slimy Liquor, which serves for a vehicle to the Seed issuing out of the Vessels, with which he judges the Seed to be encompass'd, lest it should vanish before it comes to the Womb. But in regard that in dead Carkasses the demonstrations of the Parts are not the same as in living Bodies; the Pores and narrow Passages being then so clos'd, that they will admit no breath to go through, whereas they are passable in living Bodies, I question whether those things sufficiently prove that Experiment of *Graef*, according to his forementioned Opinion. For tho' he perspicuously explain thereby as well the little Caverns of the *Prostates*, as the Liquor in them contain'd, and also their evacuating Passages, yet he does not tell us truly what that Liquor is, of what Matter generated, and wherefore that Commerce between the *Seminary Vessels* and the *Prostates*, is not so little as he describes it, but rather so much, and so necessary, that those Chanels through which the Seed is squeez'd out of the Vessels, ought to run through the middle of the *Prostates* to the *Urethra*, and through them empty the Seed into it, at the same time that the Liquor of the *Prostates* flows into it. Here we are at a stand, and therefore, seeing the *Prostates* were not placed in vain where they are, nor in vain admit the evacuating Chanels of the Vessels through the middle of their Substance; seeing they are no way beneficial to the Piss-bladder, or to the Evacuation of the Urine; seeing lastly that they contain a certain proper kind of slimy Juice, and being compress'd, empty it into the *Urethra*, with the Seed of the Vesicles; it seems also probable to us, that there is a great Commerce between them and the Seminary Vessels, and that the Seed carried thither through the occult Productions of the *Vasa Deferentia*, is contain'd in them, or else that they add something necessary to the greater perfection of the Seed, tho' the foresaid Commerce be not so perspicuous to the sight. That there is Seed contain'd in 'em, is apparent from the Observation of *Vesalius*, related in one that was troubled with a *Gonorrhea*, *Anat. l. 5. c. 13. In one,* saith he, *that was troubled with a Flux of Seed against his will, when we dissected him at* Padua, *we found this glandulous Body, when it was divided, no less full of Seed than the Stones themselves: and if we must confess*

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the truth, all the while of the Diſſection, in no part of the Body ſo great a quantity of Seed, as was found in this glandulous Body, tho' it varied from the Subſtance of the Stones in ſoftneſs and ſmoothneſs.

If therefore they contain Seed, they are not to be eſteem'd ſuch mean Parts as *Regner de Graef* ſeems to account 'em. If he object that their Liquor is not true Seed; however of neceſſity he muſt confeſs, that the Seed without it cannot have its utmoſt perfection of Fœcundity: for if without that Liquor the Seed could be perfectly fruitful, the *Proſtates* would not be given to all Males, but would have been wanting in many as unprofitable and ſuperfluous.

Whether a threefold Seed.

LXI. *Here alſo the Opinion of* Wharton *is to be rejected,* Lib. de Gland. c. 31. *and of* Antony Everard, *who both alledge that there is a threefold different Seed made in divers parts. The firſt and moſt noble in the Stones; the ſecond more ſerous in the Seminary Veſſels; and the third more thick and viſcous in the* Proſtates. *And that this threefold matter neceſſarily concurs to Generation; ſo that if one of 'em be abſent, the Seed becomes unfruitful and barren.* But they affirm this without any foundation; neither do they conſider that the ſame Seed which is made in the Stones, in its paſſage through the *Paraſtates*, acquires a greater perfection; and ſo ſome part of it is conveigh'd through the *Vaſa Deferentia*, through the occult Extremities of thoſe Parts to the *Proſtates*, but the greater part of it is carried to the Seminary Veſſels, and is there reſerv'd till the time of Evacuation. Neither is there any other Matter which is to be chang'd into Seed, that flows to theſe Parts, or is concocted or preſerv'd in 'em, than that very Seed which is concocted and prepar'd in the Stones. Beſides, if there be ſuch a neceſſity of this triplicity, how ſhall the Seed be generated in Animals, which naturally want Seminary Veſſels, as certain in Dogs; and is to be queſtion'd in Wolves and Foxes: which Animals however have a very fruitful Seed. This Opinion is by many ſtrenuous Arguments more at large refuted by *Regner de Graef*, *Lib. de viror. Organ.*

Two Queſtions.

LXII. *Here two things remain to be inquir'd into:* Firſt, *What is the true Action of the Stones?* Secondly, *How the Seed, which is thick, can paſs through inviſible Pores from the Stones to the Seminary Veſſels and* Proſtates?

The action of the Stones.

LXIII. *As to the firſt, our Opinion from what has been ſaid is plainly made out, that the Office of the Stones is to make Seed out of the Arterial Blood, and concurring Animal Spirit.*

From this Opinion of ours many depart. For *Ariſtotle* was the firſt who taught that the Stones conduce no otherwiſe to the generation of Seed, than that they extend the Seminary Veſſels by their weight, for the more convenient ejaculation of Seed; whoſe followers are *Fallopius*, *Cabrolius*, *Spigelius*, *Regius*, and ſeveral others, induc'd chiefly by theſe Reaſons.

1. *Becauſe there is never any Seed found in 'em.*

2. *Becauſe they have no Cavities or Ventricles to receive and preſerve it.*

3. *Becauſe they admit no manifeſt Veſſels through which the Seminal Matter flows in and out.*

4. *Becauſe Fiſh, Serpents, and many other Creatures that want Stones, generate.*

5. *Becauſe it is obſerv'd that ſome Beaſts have generated after their Stones were cut out: As* Ariſtotle *tells us of a Bull that bull'd a Cow, and got a Calf, after his Stones were cut out.*

6. *Becauſe* Cabrolius *reports* Obſerv. Anat. 3. *that at* Montpelier *he diſſected the dead body of a Man that had raviſhed a Virgin, in whom he could find no Stones neither within or without, but only Seminal Veſſels.*

7. *Becauſe the ſame* Cabrolius *ſaw a young Man that had no Stone, who nevertheleſs was married, and had ſeveral Children by his Wife.*

Reaſons againſt the former Objections.

LXIV. *But all theſe Arguments are eaſily refuted by the following Reaſons:*

1. Though the Seed be not ordinarily ſeen in the Stones, by reaſon of its extraordinary thinneſs, and the extream thinneſs of the *Vaſa Seminifera*, or Seed-bearing Veſſels, yet does it not follow that the Seed is therein generated. For there are no Animal Spirits to be ſeen in the Brain and Nerves, by reaſon of their ſubtility, yet can it not be thence concluded that they are not generated in the Brain, or that they do not flow through the Nerves. Now how the ſpirituous Seed is in the Stones, is hence apparent, becauſe it paſſes inviſibly out of them through the narrow ſtraits of the

the *Vasa Deferentia*, and is only plainly conspicuous in the Seminary Vesicles, in which the thicker Particles of it, being now deposited beyond the power of the concocting Parts, are more thickned, the better to enwrap the more subtile prolific Spirit, and prevent its dissipation. In the mean time, that the Seed being invisible in the Stones, yet may be made visible by Art, *Regner de Graef* has found out and taught us by this acute Experiment; who ty'd very hard the *Vas Semen deferens*, or Vessel bearing the Seed in a live Dog; so that no Seed could flow out of the Testicles, tho' at the same time the Matter that was to be chang'd into Seed flow'd in plentifully. In this Dog, after Copulation, he found the Stones and *Parastates* so swell'd with Seed, that they were distended to a large bulk.

2. Tho' they have no manifest Cavities or Ventricles, that proves nothing to the contrary; seeing there are no Ventricles in the Spleen or Liver, and yet those Bowels make necessary Ferment for the whole Body.

3. Tho' they do not seem to have any Vessels in the Substance it self in sound People, yet that they reach to the Stones, and pass through 'em, partly may be seen in crazie Bodies, partly may be prov'd by Reasons; for they are are nourish'd, live, and are sensible, therefore they admit Arteries and Nerves. From that Nourishment there is something of blood that remains over and above, which is to be remitted to the *Vena Cava*, and therefore since they cannot send it but through the Veins, of necessity they send forth Veins from themselves. Now then, if these Vessels, which are certainly and necessarily within the said Stones, are not conspicuous neither in the sound bodies of Men slain, nor cut out of the living bodies of such as are burst, what wonder is it, if the small whitish Seed-bearing Vessels, or those small Chanels through which the Vessels send forth Seed from themselves into the *Parastates*, and out of them through the *Vasa Deferentia* into the Seminary Vesicles, should be invisible; which nevertheless *Regner de Graef* has by his singular dexterity detected and render'd conspicuous. In the Substance of the Brain there are no Vessels to be found, but several pass through it, and open themselves, and pour blood into it, as is apparent from the innumerable bloody little spots that appear in the dissected Substance. Neither are any passages to be seen in the Nerves, yet that Animal Spirits perpetually flow through their invisible Pores, is not to be question'd. In like manner the most subtile Arterial Blood, penetrating through the smallest Arteries to the inner parts of the Stones, and the Animal Spirits may enter the Stones through the Nerves, and the spiritous Seed being made, may again issue forth out of them through other invisible Chanels, and so be conveigh'd through the *Vasa Deferentia* to the Seminary Vesicles and *Prostates*; tho' the passages themselves, by reason of their subtility, cannot be discern'd by the Eye.

4. Tho' some Animals, destitute of Stones, do generate, it does not follow that the Stones do not make Seed, because those unteſticl'd Animals have something analogous to Stones, wherein their Seed is prepar'd, and according to their nature no less prolific than that which in other Creatures is made in the Stones. Thus in Male-fish we have known that whitish Body, which in our Language is call'd *Hompsell*, supply the office of the Stones; and that they do copulate is manifest in River-fish, and no less certain in Sea-fish. Not many years ago we saw a *Whale* that was thrown upon our Coast, that had a Yard six or seven foot long; which Nature, no question had given him for the sake of Copulation. Hence it is not to be doubted, but that the lesser Fish are also furnish'd with Genitals; which tho' invisible to us, as in Frogs, yet that they have such Members, is plain by their engend'ring; or else that they have something else in lieu of Stones. As for *Serpents*, which as *Aristotle* says want Stones, that he speaks not true in all, the Venetian Physicians and Apothecaries well know, who by the Report of *Æmilius Parisanus*, distinguish the Male-Serpents from the Female by the Yard and Stones. And tho' perhaps there may be many that want Stones, yet in them, as in Fish, there will be something found equivalent to supply the place of Stones.

5. That some Creatures are said to have engender'd after their Stones were cut out; this, (if it be true) proceeds from hence, that before the Stones were cut out, the Seminary Vessels were fill'd with Seed, which afterwards being depriv'd of Stones, they ejected by Copulation into the Womb; and so begot by virtue of a Seed that was perfected in the Stones before. But such an Act of Generation can be perform'd no more than once; for the Vessels being emptied, there can be no restoration of new Seed, for want of the Stones and new Matter.

The

The last of which *Regius* perhaps will deny, who believes that same Seed to be only generated in the *Prostates* and *Seminary Vesicles*, and not in the Stones; and so tho' the Stones be taken away, the Generation of Seed may go forward in those parts. But this Man holds an Opinion contrary to the Experience of all Ages, which has always taught us, That Men and brute Animals, having lost their Stones, become altogether barren and unfit for Generation; and that they never recover new Seed, though the *Prostates* and Vesicles remain untouch'd, and without any dammage. Reason also confirms Experience; for out of what Matter should they make Seed, seeing that when the Stones are cut off, the Spermatic Vessels are also cut away that bring Blood for the generation of Seed? Seeing also that the Matter which is to be alter'd into Seed, can come through no other parts than through those Vessels first to the Stones, thence through the *Vasa Deferentia* to the *Prostates* and *Seminary Vesicles*?

6. The first story of *Cabrolius* proves nothing against our Opinion, because it urges a preternatural accident that rarely happens: nor is it apparent by the History, whether ever the Ravisher ejected his Seed. Moreover, if perhaps he did eject, without doubt there was something in that Person equivalent to Stones, in which the Seed might be made; which *Cabrolius* perhaps did not observe, because it was not either by him discover'd or known. *John Schenckius* writes, *Observat. l.* 3. that in *Ortelius*, a Merchant of *Antwerp*, there was no Stomach to be found after his death, but that in stead thereof the first Gut was loose, and very fleshie, which supply'd the office of the Stomach. Now from such a rare Accident as this, will any Man conclude that the Stomach does not chylifie, but that the *Chylus* is made in the *Duodene* or *Jejune Gut*? In like manner from this unusual Accident of *Cabrolius*, it does not follow that the Stones do not make Seed.

7. From the latter story of *Cabrolius* it is manifest, That that same young Man without Stones, or so thought to be, had his Stones conceal'd and latent within his *Abdomen*, and that he did not procreate without Stones. Thus *Bauhinus* tells us of a young Man of about twenty years of Age, who had no Stones pendulous without, who nevertheless was extreamly Lascivious. In like manner I my self, not many years ago, knew a Man in *Upper Holland*, that had more Children than Money, that had no Stones hanging down in his Cods: and another I knew in the Territory of *Vienna*, one of whose Stones is manifestly to be felt in his Groyn; the other no where: and therefore without doubt it must be latent in his *Abdomen*.

By what power Seed is generated.

LXV. *Therefore it must be taken for a certain Truth, That the Seed is made in the Stones. Now if any one should demand by what power, or after what manner the Stones make Seed? I shall answer, That that same Faculty proceeds from the propriety of their Substance, their proper Temper and admirable Structure, fram'd out of the meeting and complication of small Vessels.* Which Faculty I shall then more at large explain, when he that asks me the Question, shall tell me first by what power the *Stomach*, out of the *receiv'd Nourishments*, prepares no other Juice than the *Chylus*; the *Heart* out of the *Chylus* makes only *Blood*, and the *Brain* out of the *Blood* makes only *Animal Spirits*.

Whether Males are begot by the right Stone, Females by the left.

LXVI. *But seeing that both Stones make Seed which is equally good, and that there is no reason why it should be better in the right than in the left, 'tis thence apparent in what an Error they are, who write that Males are begot out of the Seed of the right Stone; Females by that of the left.* The Contrary to which Assertion, besides divers Reasons which we here omit for brevities sake, daily Experience makes manifest; while several People that have had but one Stone, sometimes right, sometimes left, have had Children of both Sexes. Captain *Couper*, becoming burstен, by reason of a violent fall from his Horse, and not being to be cur'd but by the taking away of one Stone, had afterwards by his Wife several Children of both Sexes. The same Accident happen'd to *Bernard Z.* who when a young Man, had one Stone taken from him by reason of his being burstен; who therefore was wont to brag that he could get more Children with one Stone, than others could get with two: For he was very much addicted to Venery, and had a great number of Children by five Wives, and several Illegitimates.

LXVII. *Now as to the other doubt, How the Seed, which is not only conspicuous to the sight, but seems to be of a thicker Substance, can issue out of the*

the Stones through invisible passages, to the Seminary Vesicles and Prostates, *that is done in the same manner in the Seed as in the Blood.* For in the Blood some parts are spiritous and very subtile, others thicker and more viscid, yet all fluid, which being mixt together, obtain such a thinness of parts, that they are every where able to pass through the invisible Pores of the Substance of the Parts. For do but shave the Cuticle slightly, and by and by the Blood issues forth through the invisible Pores of the Skin, and so insinuates it self into other Pores of other parts of the Body. And thus in the Seed the thicker Particles become so fluid by the thin and spiritous Particles intermix'd, containing much volatile Salt in themselves, as also by the peculiar Effervescency rais'd in the Stones, that they may the more easily pass through the most narrow and invisible passages of the *Vasa Deferentia*, though the whole substance of the Seed, when it is ejected forth, seems to be thicker. The thick and best concocted Seed passes obviously out of the Seminary Vesicles through the small and scarce visible passages into the *Urethra*, if the Vesicles be press'd with the finger, like Quicksilver strain'd through a thin piece of Leather; wherefore then may not the Seed, which is now more volatiliz'd before that condensation which happens in the Vesicles, in like manner pass through the invisible passages of the *Vasa Deferentia?* In immoderate Coition, Experience tells us, That sometimes instead of Seed Blood is ejected, which Blood if it pass through the invisible passages of the said Vessels, why not the Seed? Nevertheless I will not in the mean time deny but that the Seed may be corrupted in the Testicles, upon some Accidents, as unclean Coition, *&c.* and be then so coagulated and thicken'd, that it cannot pass thorough, and then Tumours in the Testicles happen, and other inconveniencies. But how any spiritous Humour, containing in it much of volatile Salt, can pass through invisible Pores, we shall shew more at large *Lib.* 3. *Cap.* 11.

CHAP. XXIII.

Of the Yard.

I. *THE Seed being made in the forefaid Organs, has need of a peculiar Instrument, through which to inject it into the Womb, to which end Nature has form'd the Yard to perform that Office.* *The Yard.*

II. *Now the Yard (by the Latins call'd* Priapus, Virga, Mentula, Veretrum, Coles, & Membrum Virile, *or* Genitale; *by the Greeks* πύλος & καύλος & πός*) is an Organic part primarily appointed by Nature for the injection of Seed into the Womb, and secondarily for the evacuation of Urine.* *The Names*

This is that *Priapus* who is the Tutelar Angel of Nature's Garden.

Whom Virgins and the youthful Maids implore;
But married Women on their backs adore.

That same Inchanter who by his Incantations a thousand ways bewitches the Female Sex. This is that part which makes ripe Virgins run mad, leads honest Women oftentimes astray, exhilirates the sad and melancholy, and infuses new vigour into 'em: That by its fellowfeeling warms the colder sort, by its ingress weakens the drowsie, and by its rubbing to and fro, makes the torpid lively and chearful, and raises 'em to a high pitch of pleasure. That by virtue of its sweet influence thickens young Maidens about the Hanches, and infuses wit and knowledge into ignorant Girls, by making 'em the nursing Mothers of Children.

III. *By reason of these wonders which it works,* Plato *in his* Timæus, *thought the Yard to be a sort of living Animal, and to have its own Motions and Inclinations, oftentimes rebellious and opposite to the Rule of Reason, because it is endu'd with an inbred quality so desirous of Generation.* *Whether a living Creature.* *Aristotle* also agrees with *Plato*, who calls the genital Member an Animal, *Lib. de Animal. mot. c. ult.* But in regard this longing Motion is not only inbred in the Yard, but also in the Brain, and is from thence infus'd into the Yard: and where-

as one Animal cannot be the intregal part of another; and whereas the Yard is only part of a Creature, compleating the whole with other Parts, it cannot certainly be call'd a living Creature, but only a Part and Member of a living Creature.

Situation, Figure, and Bigness.

IV. *It is seated at the Root of the Sharebone. The shape of it is oblong, and for the most part round, yet somewhat flat on the upper side. The thickness and length of it is proper for the Venereal Act, tho' in some larger, in others less.* Generally however Men of short stature, who live abstaining from Venery, also such as have large Noses, are furnish'd with a larger Yard: And hence it is that the more salacious sort of Men and Women make a judgment of the largeness of a Man's Yard from the bigness of the Nose in Men; and by the wideness of the Mouth in Women of the wideness of their Privities, according to these Verses:

Ad formam Naris noscetur Mentula maris,
Ad formamque Oris noscetur Res Muliebris.

Mens Tools according to their Noses grow,
Large as their Mouths are Womens too below.

Also Fools and the most blockish sort of People are said to have great Tools. Which Rules however does not always hold, but are subject to many Exceptions. *Spigelius Anat. l. 1. c. 10.* judges from the bigness of the Yard, of the Man's more or less proneness to Venery. *A larger Yard*, says he, *rather fills the Womb with its bulk, than waters it with a fertile Seed. For it is not so proper for Venery, which it neither vigorously undertakes, nor long sustains; the Muscles that should stiffen the rigid Spear being enfeebl'd by its weight. A smaller one therefore, on the other side is more furious and more fruitful, in regard that by tickling of the neck of the Womb, it provokes forth the Womans Seed with more delight, and maintains the Combat longer.*

Alexander Petronius, Lib. 2. de Morb. Ital. c. 17. conjectures at the Wit and Parts of the Person by the bigness of his Yard; and says that a large Tool demonstrates a thick stupid Scull, like that of the Ass.

Its Substance.

V. *The Yard consists of a Cuticle, a Skin, a fleshie Membrane, and its own peculiar Substance: But it has no fat; for that by its weight and bulk would be a hindrance to the part, and by stupefying the quickness of Sense, would hebetate and take away a great part of the pleasure.* But its own proper Substance is most convenient for it; not bony, as in a Dog, Fox, or Wolf; not cartilaginous nor fleshie; but such as may be relax'd or extended properly for the ejection of Seed. Which therefore four parts constitute, the *Urethra*, two nervous Bodies, and the Nut.

The Urethra.

VI. *The* Urethra *or Piss-pipe is the lower part of it; the inside of which is cloathed with a thin and sensible, the outside with a fungous and fibrous Membrane; and it is continuous to the neck of the Bladder, but not of the same Substance with it: for it is somewhat more spungy, and of a darker colour.* So that in the erection of the Yard it may swell and be distended, and then fall again; which things cannot fall out in the neck of the Piss-bladder. Moreover, it is separated by Concoction from the neck of the Bladder, and then the difference of its Substance most apparently manifests it self. From whence appears the Error of *Andreas Laurentius*, who writes that the *Urethra* is nothing else than the Substance of the Yard prolong'd to the end of the Yard, or the more extended neck of the Bladder. In the mean while, that it has a great commerce with the nervous Bodies, is hence apparent, that it swells and flags together with them.

The largeness.

VII. *The* Urethra *is of an equal largeness through its whole passage, except in its forepart near the* Exit, *where the Nut is joyn'd with the nervous Bodies*; as being the place where it has a little superficial hollowness, into which the sharp Urine falling in the Stone, while it is mov'd about in that place, causes great pain, and is a shrew'd sign of the Stone: and therein sometimes a sharp Liquor stopping in those that are troubled with the *Gonorrhea*, causes a very painful Exulceration.

Its Use.

VIII. *The Use of it is to conveigh the Seed and Urine:* to which purpose several small and almost imperceptible Chanels open into it from the *Prostates*, and two narrow Vessels from the Seminary Vessels transmitting Seed, of both which we have spoken in the former Chapter, and the neck of the Piss-bladder; and there is in it also a little membranous Valve, of which *Cap.* 20.

IX. *Up-*

The nervous Bodies.

IX. *Upon the upper part of the* Urethra *reſt two nervous Bodies conſtituting the greateſt part of the Yard.* Without-ſide they are thick like an Artery, alſo thick and hard; within-ſide thin and ſpungy, of a black colour inclining firſt to red, as it were fill'd with blackiſh Blood.

Their Riſe.

X. *They ariſe on each ſide from the lower parts of the Hipbone, and are faſten'd to 'em with very ſtrong Ligaments, and meet together about the middle of the Share-bone, to which they are faſten'd with a nervous Ligament underneath, but diſtinguiſh'd one from another by the coming between of a thin, pellucid and fibrous membranous Partition.* Which Partition, the nearer it comes to the Nut, the thinner it grows; ſo that before it comes to the middle of the Yard, it aſcends by degrees from the *Urethra* towards the back, and thence proceeding a little farther, inſenſibly becomes ſo thin, that near the Nut it is hardly to be ſeen, and ſo thoſe ſo nervous Bodies ſeem in that place to embody into one.

The Veſſels of the nervous Bodies.

XI. *The inner ſpongy part of theſe Bodies is fram'd of little Arteries, little Veins, and little Nerves interwoven together in the form of a Net, and the ſpiritous Blood (which flows thither through the Nerves, running thither out of the Privity) being there collected, and growing hot with the Itch of Concupiſcence, dilates and extends thoſe parts, as* Bauhinus, Riolanus, *and* Veſlingius *agree.* *Fallopius* makes no mention of the Net, but writes that there are two large Nerves, and between as many dilated Arteries that extend themſelves as far as the Nut; in like manner that double Veins run forth to the nervous Veins; but that generally in the midſt of the ſeparation they meet together in one Vein, which runs through the middle of the back of the Yard among the Arteries to the Nut: and that theſe Veſſels ariſe from much about the fourth *Vertebra*, the *Aorta* and the great Veins that run toward the Thighs, and about the Conjunction of the Share-bones penetrating through the forked Original of the Yard, are carried to the back of the Yard. This is a very exact deſcription by *Fallopius* of the Veſſels, of which the ſmalleſt Branches open toward the inner ſpungy Subſtance of the nervous Bodies: and when the Animal Spirits, with the hot Arterious Blood, flow more plentifully into it out of the Nerves and Arteries, then the Yard grows hot and extends it ſelf: but when the Spirits ceaſe to flow into it, then the more copious Blood and Spirits already within it, are ſuckt up by the little Branches of the ſmall Veins, and then the Yard falls again. Now that the Yard is extended by the influx of Blood and Spirits, is eaſily demonſtrated in Bodies newly dead: for if you immit Water through a Syringe thruſt into the Orifices of the Veins, and then force that Water forward toward the nervous Bodies, we ſhall find the Yard to be extended in the ſame manner, as we find it ſtiffen'd in thoſe that are alive by the Influx of Blood and Animal Spirits. Nevertheleſs this ſame inner Subſtance of theſe Bodies is not a meer weaving of theſe Veſſels into the likeneſs of a Net, as *Bauhinus*, *Riolanus*, and *Veſlingius* aſſert, but it is a fibrous Subſtance, compos'd of innumerable little Fibres, running and ſpreading this way and that way, equally reſtraining the ſurrounding Membrane from too much dilatation, and underpropping the little Veſſels that are interwoven betwixt 'em; and ſo receiving within their hollow ſpaces the Blood and Spirits wandring out of the Veſſels through that ſame Subſtance. *Wharton* writes that thoſe Bodies have a glandulous Fleſh within, which after a certain manner fills and ſtuffs up its little Boxes, and defends from too much falling and weakneſs in the *Interſtitiums* of Coition. But *Regner de Graef* demonſtrates and evinces by Ocular view, that there is no ſuch thing as that glandulous Fleſh in the little hollowneſſes, which he proves by an egregious Experiment there at large ſet down.

The Glans.

XII. *At the end of the Yard is the Nut, in Latin* Glans, *in Greek* βάλανος, *in which the two foreſaid nervous Bodies, with the* Urethra, *end. The lower part of which, that exceeds thoſe three Bodies ſomewhat in compaſs, is call'd* στεφανὴ, *or the Crown.*

Figure and Colour.

XIII. *The Figure of it is ſomewhat like a Top; the colour of it, when the Yard is fallen, ſomewhat bluiſh; when erected red.*

Subſtance.

XIV. *It has a Subſtance peculiar to it ſelf, fleſhie, ſoft, ſpungy, exquiſite for its ſenſe of feeling, and enfolded with a thin Membrane, and hollow'd with a long hole before.* The infold-

ing Membrane is produced from the inner Membrane of the *Ureter*, which going out at the hole, turns back and spreads it self over all the Nut, and endows it with a most acute sense of feeling, which it ought to have first to that end, to excite the greater pleasure in Copulation, which unless it should be, hardly any one would mind the Act of Generation, and so the race of Mankind would in a short time be extinct. Of which thing *Andreas Laurentius* thus elegantly writes, *Anat. l. 7. c. 1. Hence*, says he, *the Titillation of the obscene Parts, and the most exquisite sense of feeling: for who would desire such a nasty thing as Copulation, embrace and indulge with so much eagerness? With what face would that Divine Creature Man, so full of Reason and Consideration, be brought to handle the obscene Parts of Women, defild with so many Nastinesses, and for that cause plac'd in the lower part of the Body, like the Sink? What Woman would throw her self into the Embraces of the Male, knowing the Terrour of her nine Months burden, and the Pain of her Labour, which many times also proves no less fatal than painful, or endure the Cares and Toyls of breeding up her Birth, were it not for that incredible sting of tickling pleasure with which the Genitals are endu'd.*

The Foreskin. XV. *The outward part of the Nut is cover'd with a* Præputium; *which is compos'd of a Cuticle and a Skin, a little nervous and thin Skin proceeding inwardly from the fleshie Pannicle.*

The Bridle. XVI. *This toward the lower part, below the hole, is ty'd to the Nut with a little Bridle.*

Præputium. XVII. *This is that* Præputium *or Foreskin which is cut away by the* Jews *and* Mahometans: *and it is a wonderful thing, what divers Persons of great Credit have related to us from their own Observation, that this Part is six times bigger in the Children of* Jews *and* Turks, *than in our Christian Infants:* And in some is of a prodigious bigness, even to the breadth of a Thumb, and hangs down below the Nut, till cut away. And *Vestingius* testifies the same thing of the Children of the *Egyptians* and *Arabians*.

This Foreskin in Copulation rolls back from the Nut, and slips below the Crown, by which means the whole bulk and thickness of the Yard is made equal without any roughness: and this repeated drawing forward and slipping back of the Foreskin in Copulation, is thought to increase the pleasure of Women in Copulation: and hence *Riolanus* tells us out of *Fragosa*'s Spanish Surgery, that the *Turkish* and *Ethiopian* Women covet more eagerly the Company of Christian Slaves, than of their Circumciz'd Husbands, as much more delightful.

Sometimes it happens that this Foreskin is so strait and narrow, that it cannot be slipt from the Nut, which causes the standing of the Yard to be very painful, while the Nut is straitned within that narrow enclosure: of which sort of Patients I have met with many in Practice, and cur'd 'em by Incision of the Foreskin in the upper part: the Lips of which Incision are easily cur'd, but the Nut will never come to be cover'd with the *Præputium* afterwards; which is not a straw matter; seeing I have known several who have had so short a Foreskin, that it never cover'd the Nut, who suffer'd however no Inconvenience for all that.

The Vessels of the Yard, and first the Arteries. XVIII. *The Yard receives all manner of Vessels. It has two remarkable innermost* Arteries *from the* Hypogastrics, *dispers'd first through the Nervous Bodies, at the beginning of whose Meeting they enter, and run along quite the length of the Yard, sending forth little Branches to the Sides: But the outermost* Arteries *it receives from the* Pudenda.

The Veins. XIX. *It sends forth the inner Veins to the* Hypogastrics; *and the outer Veins to the Privities.*

The Nerves. XX. *It has outer and inner Nerves from the Marrow of the* Os Sacrum; *of which two, of a moderate Bigness, run quite the length of the Yard at the lower Part, together with the Arteries and Veins.*

Muscles. XXI. *It is mov'd with four Muscles: Of which two shorter and thicker, proceeding from the* Tuberous Nervous *Beginning of Hip or Huckle-bone, not far from the Exit are fastened to the Bodies of the Yard, and serve for Erection. The other two longer and slenderer rising from the Sphincter Muscle of the right Gut, and carried underneath, are inserted into the Sides of the* Urethra *about the Middle, which they dilate for the more ready Emission of Seed and Urine, and also compress the*

the Seminary Veſſels ſeated in the Perinæum, *or Space between the Cod and the Fundament.* And becauſe they haſten forth the little Drops of Seed and Urine, they are call'd *Accelerators.* This Uſe of the Muſcles *Regner de Graef* abſolutely rejects, and aſcribes to 'em a far different Function, that when they ſwell they may compreſs the Nervous Bodies on both ſides, and by that means ſuddainly thruſt forward toward the Nut, the Blood flowing in through the *Arteries*, and for ſome time ſtop the ſame Blood being about to flow back again, by compreſſing the Veins, thereby to preſerve the Yard ſtiff for ſome time. But in regard the Office of the Muſcle is only ſingle, by contracting it ſelf to draw the Part to which it is faſten'd, and that the Muſcle was primarily ordain'd for that ſort of Action, and whatever happens from it beſides that Action of its own, that happens only by Accident; of Neceſſity, as in all others, ſo in the Muſcles of the Yard, that Action is to be held unqueſtionable, and we muſt of neceſſity maintain that theſe Muſcles cauſe the Erection of the Yard, and Dilatation of the *Urethra.* If by Accident, while they ſwell, they may ſomewhat compreſs the Nervous Bodies, according to *Regner de Graef*, that does not take away their peculiar and primary Action, nor can it be concluded from thence, that they do not erect the Yard, but only ſerve for that accidental Uſe.

Erection of the Yard.

XXII. *When in the heat of Luſt the Animal Spirits plentifully flow into theſe Muſcles and the two nervous Bodies, then the Yard ſtirr'd with venereal Violence is extended and becomes ſtiff.* The manner and Bulk of which Extenſion all Men underſtand that are not in the number of bewitch'd and frigid. But that certainly muſt be a vehement Extenſion beyond the uſual Meaſure in the young Man of two and twenty Years of Age, which *Schenkius* ſpeaks of *in exercit. An.* who without any trouble for half an hour together carried a Pewter Flagon containing five Meaſures of Ale, upon his ſtanding Yard, not without the Admiration and Laughter of thoſe that beheld it.

Its Office.

XXIII. *The Office of the Yard ſufficiently appears from the Definition, and what has been already ſaid.*

Whether any Generation without the Immiſſion of the Yard.

XXIV. *But in regard that Generation cannot be accompliſhed without the Yard, by the Conſent of all Philoſophers and Phyſicians, the Queſtion is whether it can be perfected without Immiſſion of the Yard into the Sheath of the Womb?* Reaſon dictates that it cannot otherwiſe be perform'd, ſince without the Immiſſion of the Yard, the Seed of the Man cannot be injected into the Womb of the Woman. Yet Experience has ſometimes taught the contrary, *viz.* That Women have conceived without the Immiſſion of the Yard. Of which *Riolanus* gives us four Examples, one upon his Knowledg, and three upon the Report of others. *Lately*, ſays he, *we ſaw a Woman at* Paris, *who by means of a hard and difficult Labour had her genital Parts torn and dilacerated, whoſe Nymphæ, and four Caruncles were ſo cloſely grown together, that they would hardly admit the end of a Probe, and yet this Woman conceived with Child: For the Womb covetous of that Food, had attracted within the Lips of the Privities, the Seed that was ſhed round about it; as a Hart draws Serpents out of their Holes by the Breath of his Noſtrils. When ſhe was ready to be brought to Bed, the Hole was opened by the means of a* Speculum Veneris, *to that wideneſs which was requiſite for the coming forth of the Birth*, and ſo ſhe was delivered of a perfect Birth ſafe and well.

A Second he cites that was ſeen at *Paris* in the Year 1609. *A Third*, he cites out of *Clementina* 1. *Queſt.* 15. *de Conſang.* of a certain Maid impregnated, the Fences of whoſe Virginity were all firm and untouch'd. *A Fourth* he quotes out of *Fabricius*'s Surgery, of a Woman that conceived meerly from the Embraces of the Man, without the Immiſſion of the Yard. A Hiſtory like to which of a *Roman Virgin*, to whom the like Accident happened, is related by *Henry a Monichem* in *Lyſerus Obſervat.* 13. I my ſelf remember in the Year 1637. being then at *Nimmeghen*, that I was ſent for to a poor Womans Labour, living near the *Crane Gate*, of whom the Midwife related, that a ſtrong tranſverſe Membrane with a little Hole in the middle, was extended at the Entrance of the Sheath, ſo ſtrong that ſhe could not burſt it with her Finger: This hindered the Midwife from getting in her Finger; and in regard ſhe was much leſs in a Condition to receive her Husbands Yard, all wondered how ſhe could be got with Child. Upon which the Husband confeſſed that he frequently try'd whether

whether he could make way through that Obſtacle when he was at the ſtiffeſt, but that he never could penetrate or get farther in; however that in the Attempt he had ſeveral times ſpent againſt that Membrane. Whence I conjecture that the ſame Seed aſcended through the aforeſaid Hole in the Membrane toward the Womb, and by that means the Woman came to Conceive. I adviſed the cutting away that Membrane, and dilating the Part, but her Modeſty not willing to admit a Surgeon in the midſt of bitter Pangs of Childbed, the Paſſage being ſhut againſt the Birth by that ſturdy Membrane, ſhe loſt both her own and the Life of the Child. By all which Examples it appears that ſometimes there may be a Conception without Immiſſion. But theſe are Accidents that rarely happen, whoſe Examples conſtitute no Rule, in regard that Husbands rarely complain of ſuch kind of Obſtacles.

The Parts adjoyning. XXV. *The Parts next adjoyning to the Yard are called by various Names. The Part above is called* Pubes; *to the Parts on each Side are given the Name of* Inguina *or the* Groyns: *The Part from the Root of the Cod to the Fundament is called the* Perinæum, *from* πεινέω *to flow about, becauſe that Part is generally moiſt with Sweat.* All which Parts, the *Pubes*, the *Groyns*, *Perinæum*, *Scrotum*, to the Circuit of the *Podex* in People grown to mature Age abound with Hair, with which Nature would in ſome Meaſure cover the ſecret Parts. Which Hair both in Men and Women, begins to appear about the fourteenth Year, when riper Reaſon diſtinguiſhes Vice from Vertue. *Riolanus* alſo obſerves that in Women who have no *Perinæum*; ſeldom any Hair grows about the *Podex*, unleſs when they come to be very Old.

CHAP. XXIV.

Of the ſecret Parts of Women ſerving to the Generation of Seed and Eggs.

Aproœmial Diſcourſe. I. *IN the foregoing Chapters we have explained the genital Parts of Men: Order therefore requires that we ſhould now proceed to the generative Parts of Women, that is, to the Deſcription of thoſe Parts, that involve Women in a thouſand Miſeries, enervate Men a thouſand manners of ways, by means of which weak and feeble Women triumph over the ſtrongeſt of Men.* Parts which have ruined many the moſt potent Kings, deſtroy'd Emperors, made wiſe Men Fools, deceived the Learned, ſeduced the Prudent, thrown the Sound into moſt ſhameful Diſtempers, impoveriſhed the Rich, and vanquiſhed the ſtouteſt Hero's: That hurried holy *David* into Sin, led away *Salomon* to Idolatry, proſtrated the Strength of *Sampſon*, and compell'd the ſtouteſt *Hercules* to the Diſtaff; for whoſe Sake *Sichem* was laid waſt, *Ilium* ruined, and many Kingdoms have been depopulated: I ſay to the Deſcription of thoſe Parts, which alone by ſome peculiar ſorts of Inchantments are able to drive the Minds of moſt Men, and thoſe the moſt Prudent, to Diſtraction, while they think theſe to be the ſweeteſt and the faireſt Parts in Women, which are the moſt foul and naſty in her whole Body, ſordid and diſeaſed Parts; beſmear'd with ugly Blood and Matter, defil'd with hourly Piſs: Smelling of Sulphur and Puddle-Water, and as if unworthy to be ſeen placed by Nature in the moſt remote and ſecret Part of the whole Body, next to the *Anus* and its Dung; being the Sink of all the Naſtineſs and Uncleanneſs of her Body. To the Deſcription of thoſe Parts in which, tho' the *Barathrum* of all the Naſtineſs of Womans Body, the proudeſt of Creatures, in a ſhort time to aſcend Heaven it ſelf, even Man himſelf is conceiv'd, delineated, form'd and brought to Perfection by the Will of the firſt Creator; that afterwards calling to mind his abject Beginning, his ſordid and unclean Domicil, he might not ſwell with Pride, nor erect his Briſtles againſt his Creator, but with all Humility admire the Omnipotency of God; and adore his Divine Sublimity and Majeſty with due Veneration; and implore from him another better, more bleſſed, and eternal Habitation for his Soul in Heaven, not to be obtained but through his Immenſe Clemency and Mercy.

The Diviſion. II. *Now theſe Parts ſerving for Generation in Women, are twofold; ſome are ordered for the making and paſſage of the Seed or Eggs; and others for Conception.* III.

The preparing Vessels.

III. *In the making of Eggs sundry Parts are of great Use: Among which we meet first with the preparing Vessels, which are twofold,* Arteries, *and* Spermatic Veins.

Spermatic Arteries two.

IV. *The* Spermatic Arteries *are two, proceeding under the Emulgent from the* Aorta, *and carrying spirituous Blood to the Stones for their Nourishment and the making of Eggs.* The left of these *Arteries Riolanus* reports that he himself has seen in many Women to spring from the *Emulgent*, which I could never see in my Life. *Bartholine* also writes that he has observed a Defect of both. What is to be thought concerning this Matter has been above declared *C.* 22. *Regner de Graef* has accurately noted how these *Arteries* descend from their Beginning to the Stones. *The* Spermatic Arteries *of Women*, says he, *differ from the* Spermatic Arteries *of Men, for those which in Men hasten with a direct Course to the Stones, in Women are sometimes wreathed into various Curles, imitating the Shoots and Tendrils of Vines; and sometimes winding from side to side, with a Serpentine Course approach the Stones, and that more numerously in the one than the other Side, and seldom are ordered after the same manner as in Men.*

With these *Arteries* descending by the Sides of the Womb, on both sides meets the *Hypogastric Artery*; ascending by the same sides with a winding and serpentine Course, which as some thought, clos'd together by *Anastomoses* with the *Spermatic Artery*; but quite contrary to all Sense and Reason, when the Blood of the *Arteries* forc'd upward and downward by the Pulsation of the Heart, cannot be forc'd upward and downward out of one Artery into another: For so either two contrary Motions must be granted in the same Artery, which is absur'd; or the Blood of both Arteries would meet one with the other, and so not be able to flow any farther, but of necessity must stop by the way.

Spermatic Veins.

V. *The Spermatic Veins are likewise two, carrying back the Blood that remains after the Nourishment of the Stones and Eggs, to the* Vena Cava. *The Right Vein of these two ascends from the Testicle to the Trunk of the* Vena Cava, *below the Emulgent, but the Left ascends to the Emulgent it self, and opens into it after the same manner as in Men.* Saltzman *observ'd these Veins double on both Sides in a certain Woman, as he testifies in his* Observat. Anat. *But this happens very rarely.*

Both these Vessels are shorter than in Men, because that the Stones of Women do not hang forth without the *Abdomen*; and somewhat separated above, but in their Progress toward the lower Parts, they go joyn'd both together, and are closely knit together with a Tunicle proceeding from the *Peritonæum*. Nevertheless they do not fall out of the *Peritonæum*, but are divided into two Branches near the Stones, of which the uppermost is inserted into the Stone with a threefold Root, and in its Entrance constitutes a watry Body, but somewhat obscure, according to the Opinion of *Ruffus Ephesius*, to which *Dominic de Marchettis* subscribes: The other is divided below the Stones into three Branches, of which the one goes to the bottom of the Womb; another approaches the Tube and round Ligament; a Third, creeping through the sides of the Womb under the common Membrane, ends in the Neck of it, wherein being divided into most slender Branches, it mixes with the *Hypogastric Vessels* turn'd upwards, in the form of a Net. *Through which Passage sometimes the Flowers flow from some Women with Child, and not from the inner Concavity of the Womb.* Which Blood however at that time, flows not thither so plentifully through the *Spermatic* Vessels as through the *Hypogastrics*.

Nerves.

VI. *Besides these little* Vasa Sanguifera, *there are very small Nerves that run forth to the Stones from the sixth Pair, and the* Lumballs.

Lymphatic Vessels.

VII. Wharton *also believes there are some* Lymphatic *Vessels that run between the rest of the Vessels; which also was observ'd by* Regner de Graef.

The Spermatic Vessels adhere to the Testicles.

VIII. *To the Spermatic Vessels below adhere the Stones, whose History before we begin, it behoves us to promise a few things.* That is to say, that in our times, wherein many Secrets lying hid in the Body are brought to Sight by Anatomy, by the same Diligence of Anatomists, the unknown *Ovaries*, and Eggs in Womens Privities have been discovered, by which means it has been found that their Testicles are real Ovaries, wherein real Eggs are bred and contain'd, as in the *Ovaries* of Fowl.

This

This new Invention easily drew to it self the Lovers of Novelty: But others desirous of a more accurate View joyn'd with Reason, could not be so easily perswaded to believe it. But afterwards, when upon a clearer Demonstration of these Eggs, men still took more Pains, it came to this at length, that no Anatomists of Repute and Experience make any farther Doubt of them.

The first Discoverer of these Ovaries.

IX. *The first Discovery of these* Ovaries *and Eggs we owe to* John Van Horn, *an Anatomist of* Leyden, *who published this his Discovery in an Epistle to* Rolfinch, *printed* 1668. *By whom other Anatomists being incited, resolv'd to go on with what* Van Horn, *snatch'd away by an untimely Death, could not live to bring to Perfection:* Among whom, *Regner de Graef*, Physician of *Delph*, deserves the Laurel, tho' to the great Damage of the Art of Anatomy, snatched away likewise in the Flower of his Age, who put forth his accurate Discovery with elegant Cuts, and his own Speculations upon the History of Eggs, in the beginning of the Year 1672. Whom, some Months after followed *John Swammerdam*, a Physician of *Amsterdam*, who nevertheless in his little Book which he calls the *Miracle of Nature*, contends most sharply with *Regner de Graef* for the first little Honour of putting forth Cuts, and that with so much Heat, that he seems to besmear the whole *Ovary* together with the Eggs, not with *Honey*, but with most bitter *Gall*, complaining, that he could not prevent the other with a more early Edition of his Book.

That Womens Stones are ordained for the generating of Seed, tho' not so perfect as is the Seed in Men; and that this Seed is infused partly into the Womb, partly into the *Uterine Sheath*, from these Stones through the *Fallopian Tubes*, and other Passages describ'd by other Persons, in former Ages even till our times, was written and taken for granted by all Physicians and Anatomists, so that it was by my self held for a thing not to be controverted: Which was the reason that I wrested some Arguments against this new Invention of Eggs and *Ovaries*, which till then I never saw or heard of. But afterwards examining the thing more diligently, and comparing the Observations of others, printed upon that Subject, with my own ocular Views, I found that my own, and the Opinion of the Ancients could not hold: which I am forc'd to confess in this second Edition of my Anatomy.

Their Number.

X. *These Stones are two, more soft, more flagging, more unequal, and less than in Men.* But sometimes somewhat bigger and softer, sometimes lesser, harder and dryer, according to the Age of the Party, and her moderate or immoderate use of Venery.

Weight & Magnitude.

XI. *Their Bigness according to Diversity of Age* Regner de Graef *describes by weight. For he observ'd in Children and new-born Infants, the Stones to be from five Grains to half a Scruple; in such as had attained to Puberty, and were in the Flowre of their Age, that the Stones generally weigh'd a Dram and a half, and so were much about half the Bigness of a Mans Stone:* * *That in more elderly People they became less and harder: In decrepit Persons that they weigh still a Scruple.*

* *By this account it appears that the Testicles of a Man weigh but three Drams: However whether they may be accounted as the more general Weight or Magnitude in all Men, I will not determine. This I can tell, that in two Men opened, neither of which were extraordinary great or large Persons, a Testicle of the one weighed six Drams, and of the other five Drams: So that I believe there is a great Diversity, as to the Weight of them, in all Mankind.* Salmon.

But 'tis very probable this Rule cannot be so exactly set down, but that it may suffer some Exception, and that in Womens as in Mens, there may be some Variety of the Bigness. For in Persons that have dy'd in the Flowre of their Age, according as they have been more or less prone to Venery, we have observed the Bigness, and consequently the Weight to vary, by our Inspection of dead Bodies, nor have we found 'em to be alike small in old Women.

Situation.

XII. *They are seated within the Concavity of the* Abdomen, *adjoyning on both sides to the sides of the Womb, at the upper part of the Bottom, in Women that are clear, about two Fingers, or one and a half remote from it; (but in Women with Child, the Bottom swelling recedes upwards by degrees) and fasten'd to it with broad membranous Ligaments.* On the other part, adhering to the Spermatic Vessels, by the help of the Membranes wherein those Vessels are infolded, about the Region of the *Os Ilium*,

Ilium, they ſtick cloſely to the *Peritonæum*, and obſerve the ſame hight with the bottom of the Womb in Women that are empty, but in Women with Child are remov'd more and more from it, aſcending by reaſon of its Increaſe. But they hang by no Cremaſter Muſcle, for that not being pendulous without, they need not thoſe Muſcles to draw 'em up to the upper Parts, ſo that they are only held and ſtrengthened by the broad Ligaments.

Their Figure. XIII. *Their Figure for the moſt part Semi-Oval, in the fore and hinderpart ſomewhat broad and depreſs'd.*

The Tunicle. XIV. *They are infolded with a ſtrong Tunicle, call'd in greek* ὑστέρα, *which ſome aver to be ſingle and proper to themſelves; others ſingle, but produc'd from the* Peritonæum; *others double and conſiſting of one proper, and another common, proceeding from the* Peritonæum, *ſtrongly annexed to the former.* But this Diviſion of it into two Membranes, ſeems to be a thing hardly to be ſeen, and difficult to be affirm'd.

Difference from mens Teſticles. XV. *They differ in Subſtance very much from the Stones of Men, whereas the one are form'd of little ſeminary Veſſels joyn'd and interwoven one within another with a wonderful Order: But theſe conſiſt of Membranes, Veſſels, and other Bodies.*

Their Subſtance. XVI. *This Subſtance of theirs,* Regner de Graef *has with great Diligence inquired into, diſcovered and deſcrib'd in theſe Words.*

Their inward Subſtance, ſays he, *is compoſed chiefly of many little Membranes and ſmall Fibres, looſely united one with another, in the ſpace between which are found ſeveral Bodies, which are within either naturally or preternaturally. The Bodies naturally found in the Membranous Subſtance of the Stones, are little Veſſels full of Liquor, Nerves, and preparing Veſſels, which run forward almoſt in the ſame manner as in Men, to the Stones, and creep through their whole Subſtance, and enter the Veſſels, in whoſe Tunicles numerous Tunicles vaniſh after they have copiouſly diſperſed and ſpread themſelves, as we find in the Yolks of Eggs annexed to the Branch of the* Ovary. *And*, ſaith he, *the Lymphatic Veſſels found in the Stones, whether they enter their Subſtance we have not ſo clearly diſcovered as to affirm it; tho' we believe it agreeable to Truth.* And he adds farther, *That what things are ſometimes only naturally found in the Stones of Women are little Buttons, which like the Conglomerated Glandules, conſiſting of many Particles tending in a direct Courſe from the Center to the* Periferie, *and are infolded with their own proper Membrane. We do not ſay theſe little Glandules or Buttons are always in the Stones of Females, for they are only diſcovered in 'em after Copulation one or more, as the Female is to bring forth one or more Creatures into the World after that Copulation. Nor are they alike in all Creatures, nor in all ſorts of Creatures. For in Cows they are of a yellow, in Sheep of a red, in other Creatures of an Aſh-colour. Moreover ſome few days after Copulation they come to be of a thinner Subſtance, and the middle of 'em contain a lympid Liquor included in a Membrane, which being thruſt forth together with the Membrane, there remains a ſmall Hollowneſs only in 'em, which by degrees is ſo entirely defaced, that in the laſt Months of Childbearing they ſeem to be compoſed of a ſolid Subſtance: At length the Birth being born, thoſe little Glandules diminiſh, and at laſt quite vaniſh.*

Now thoſe things that are obſerved to be Preternatural in the Stones of Women are watery Bladders, call'd Hydatides, *little ſtony Concretions, and preternatural Swellings, call'd* Steatomata, *and the like.*

Preternatural things in Womens Stones. XVII. *Sometimes other preternatural things are found therein, in a ſickly Condition of Body.* In the Years 1656, 1658, 1663. I diſſected three Women, wherein one Stone exceeded the other the bigneſs of a Stool-Ball, and contained a viſcous Humour, the other Stone being ſound and well. In ſeveral others that were much troubled with the Mother while they liv'd, for the moſt part I found ſome exceſs of Bigneſs indeed, but far leſs, than in that before mentioned, and ſometimes in one, ſometimes in both, a certain Saffron coloured, or yellowiſh ſort of Liquor. *Dominic de Marchettis*, in a certain Woman, ſaw the right Teſticle ſwell'd to the bigneſs of a Hens Egg, and full of Seroſity: And in another the Stones ſo intangled with the Ligaments and Tubes, that they ſeem'd to be one fleſhy Maſs without Diſtinction. *Bauhinus* writes that Stones have ſometimes been

been seen bigger than a Mans Fist: And there he makes mention of the Dropsie in the Stones, in a Woman that dy'd of such a Dropsie; out of the swelling of whose right Stone he drew out nine Pints of Serum, the left exceeding the bigness of a Quince, and abounding with many watery Bladders. To these he adds the Story of another Woman, whose right Testicle he found to be as big as a Goose Egg, full of long white Hair sticking in the Tunicle, encompassed with a kind of slimy Matter like Suet.

The aforesaid Vesicles which are found in the Stones, according to the Nature of which *Regner de Graef* makes mention, were also long before observ'd by *Fallopius*, and *Caster*, but what they were, or to what Use they serv'd they could not tell.

Eggs. XVIII. *These things afterwards* Van Horn, Epist. ad Rolfinc. *was the first that call'd Eggs, and that most convenient Name succeeding Anatomists deservedly retain'd, seeing that they are really Eggs, and that while they were yet but very small, there is nothing but a certain thin sort of Liquor contain'd in 'em, which is like to the White contained in the Eggs of Birds, and those Eggs being boyl'd, it hardens in the same manner like the White in the Eggs of Birds.* Neither does it differ in Consistence or Savour from this White. Quite otherwise than the Liquor contained in the *Hydatides* or watery Bladders (which *Fallopius*, *Vesalius*, *Riolanus*, and others, erroneously took for these Eggs) which will neither harden with boyling, nor savour at all like the White in the Eggs of Birds.

The Membranes of Eggs. XIX. *The Eggs of Women and of all other Creatures that bring forth living Animals, are wrapt about with a double Membrane, one thicker, the other thinner. The one in Conception makes the* Chorion, *and the other the* Amnion. Now in Creatures bringing forth living Conceptions, there was no need that the outward Membrane should be hard and crusty, as in Birds: For in the one it was to be preserv'd without the Body, and therefore to be defended by that outermost Rind from external Injuries. But this hardness was not necessary to preserve 'em while within the Body, as in which external Injuries are sufficiently kept off by the hot Parts that ly round about it, the Womb, the *Abdomen*, &c.

Eggs in all sorts of Creatures. XX. *But that Eggs are found in all sorts of Creatures, is now certainly taken for a thing ratified and confirm'd on all Hands, which as it is accorded as to Birds, Fish, and several sorts of Insects, so by innumerable Dissections, the same is now as unquestionable as to Creatures that bring forth living Conceptions.* Tho according to the diversity of Creatures, the variety of Bigness is not the same but very different; and more than that, besides greater already brought to Maturity, in many there are found several lesser, that would by degrees have grown to their full bigness. Nor is the Number always the same, but one, two, three, or more, according to the number of Conceptions which the Creature will bring forth. But in those Creatures where the matter is not apt and proper for the Engendering of fruitful Eggs, as in old Women and Mules, or by reason of the ill Temper and Composition of the Eggs, there they become Barren.

The Matter of Eggs. XXI. *These Eggs are begot in the Stones of Females that bring forth living Conceptions, out of a spirituous Blood flowing through the preparing Arteries, and an Animal Spirit flowing through invisible Nerves to the Stones; and leaving in their membranous and kernelly Substance Matter sufficient and proper for their Generation, while the rest of the remaining Humours return to the Heart, through the little Veins and small Lymphatic Vessels.*

Ovaries. XXII. *From all that has been said, our modern Anatomists conclude, following their Leader* Van Horn, *that the Testicles of Women should be rather called their* Ovaries *than their Stones; and that chiefly for this Reason, for that neither in Shape nor Substance, nor in what they contain they have any Likeness or Resemblance to the Stones of Men.* And hence it was without doubt, that they were accompanied by many unprofitable Parts; tho' their absolute necessity appears from the spaying of Women, who, upon the cutting out of these Parts become no less barren, than Men upon the cutting out their Stones. But whether Stones or *Ovaries*, 'tis not a Straw mat-

matter, so we agree in the main about the thing it self.

Various Errors of the coming of the Seed to the Womb.

XXIII. *Now how these Eggs come to the Womb from the said* Ovarie, *as being most obscure, requires a stricter Examination. By what Passages the Womans Seed came to the Womb from her Stones, before the discovery of Eggs, several have varied in their Explanation.* Some, with *Galen*, thought those short Processes extended from the Stones to the Neck of the Womb, were the *Vasa deferentia*, or deferent Vessels. Others conjecture that from these Processes near the Womb, there was deriv'd a peculiar Branch to the Neck of the Womb, and so the Seed was carried partly to the bottom of the Womb, partly to the beginning of the Neck; and that the Seed was evacuated through the upper way in empty Women, but through the lower way in Women with Child. *Riolanus* describes a little hard Vessel from the lower part of the Testicle, white and very slender, and another like it contain'd between the Tube of the Womb, through which two being joyn'd together, in the bottom of the Womb he alledges the Seed to be poured forth into the Concavity of the Womb; and lastly from these he believes another little slender Branch to be also deriv'd to the Neck of the Womb. But more modern Anatomy plainly shews, that the first were deceived by the Divarication of the *preparing Arteries*. *Riolanus*, by his Inspection of the little Nerves running forth that way: And that through the first Passages nothing but Blood passes; through the latter nothing of Seed, but only invisible Animal Spirit.

Spigelius, and *Vestingius*, asserted that part of the Seed in empty Women passed through the round or lumbrical Ligaments of the Womb; but that all the Seed in Women with Child copulating flow'd through the same toward the *Clitoris* and Sheath, with whom formerly I altogether agreed, because I saw therein, toward the end, a slimy sort of Liquor like Seed; which might be some flegmatic Excrement, but afterwards I forsook their Party, for that being admonished by the Observations of others, by a more accurate Inspection, I could not find any Hollowness in those Vessels through which those Vessels could pass.

That the Seed of the Woman is not injected into the Cavity, but into the Porosities of the Substance of the womb it self: And the Seed of the Man, either is not injected into the Cavity of the Womb, or being injected into it, by and by flows out of it again, as of no use, *Harvey*'s Inspections could never persuade me; for by that means the Seed of the Woman being enfertiliz'd with the Seed of the Man, in order of Circulation, might easily be driven through all parts of the Body, and so be matur'd by any convenient Heat; and be adapted for the Formation of the Birth.

The true way of the Seed and the Eggs.

XXIV. *These things premised, from all that has been said, it is clearly manifest that there is no true female Seed, as the Women's Eggs and the* Vasa deferentia *of the Eggs sufficiently declare; but that the most spirituous Parts of the Prolific male Seed being injected into the Womb, flows through the Tubes from the Womb to the Testicles and the Eggs therein contain'd; and that those Eggs impregnated with this Seed fall from the Testicles, and are received by the Extremities of the Tubes annexed to 'em, and so through those by degrees are thrust forward to the Womb.*

The Tubes.

XXV. *These Tubes, from their first Inventor were call'd* Fallopian, *and are the* Vasa deferentia, *or deferent Vessels, wherein* Fallopius *affirms that he has both found and shewn before credible Spectators most exquisite Seed.* Which Tubes he thus describes. *But that same seminary Passage*, says he, *rises very slender and narrow, nervous and white, from the Horn of the Womb it self, and when it has parted a little way from it, it becomes broader by degrees, and curls it self like the Tendril of a Vine, till it comes near the end; then those Tendril-like Wrinkles ceasing, and being become very broad, it ends in a certain Extremity which seems to be membranous and fleshy by reason of its red Colour; which Extremity is very much ragged, and worn like the Edges of a worn Cloth, and has a large Hole, which always lies shut; those extream Edges and Jaggs falling down together, which if they be carefully opened and dilated, resemble the extream Orifice of a brazen Tube.*

What the Tubes *are.*

XXVI. *These Tubes of the Womb, so called from their crooked Shape,*

are two Bodies adjoyning to the sides af the womb, hollow, stretch'd out from the bottom of the womb, and composed of two Membranes.

Their Membranes. XXVII. *The innermost of these Membranes is common with that which closes the womb withinside, but not so smooth, and that more about the Extremities than in the middle. The outward Membrane is common with the external Membrane of the womb, and very smooth, near to the womb somewhat thicker, but about the Extremities thinner or smaller.*

The Figure of the Tubes. XXVIII. *The beginnings of the Tubes running forth from the womb, by degrees are more and more dilated, and having acquired a remarkable Capaciousness, by degrees become more and more crooked, and run on with a tendril-like Course till they encompass about the one half of the Substance of the Stones with the other Extremity; and are very much dilated about the Stones in the first place, and by and by contracted, and beyond their Contraction slit into many Jaggs, to which* Regner de Graef *has observed many watery Bladders and hard Stones to stick.* Now because that after the said Dilatation, being suddainly narrowed again, they run to the Stones with a very slender Course, hence it is that in women at first sight they seem somewhat remote from the Stones; and only fasten to the Stones by a thin Interposition of Membranes like the wings of Bats. But in many Creatures they are found to be very near annexed to the Stones, and in many they half embrace the Stones. And so the Tubes according to Nature are passable from the Stones to the Womb, but only once *Regner de Graef* found 'em preternaturally clos'd up.

The Vessels. XXIX. *They are furnished with spermatic Arteries, and Nerves from the same, that penetrate the bottom of the womb.*

Whether they have Valves. XXX. Wharton *ascribes Valves to these Tubes, so placed that nothing of seminal Matter may flow from the Stones to the womb, and affirms that he observ'd it in the Dissection of a Mare.* Others describe to us Valves placed in a contrary Situation, preventing the Ingress of things contained in the womb, into the *Tubes*. But besides Inspection, Reason teaches us there can be no Valves in these Vessels, when the Contraction of the Extremities alone is such, that they will not allow the Passage of any thing through 'em, unless in heat of Lust they be dilated by a plentiful Flux of arterious Blood and Spirits, and so the spirituous part of the masculine Seed may penetrate from the Womb to the Stones and the Eggs, and then again permit these Eggs to pass from the Stones to the Womb.

Whether distinguished into Cells. XXXI *Some there are that have conceited several Cells and various Receptacles distinct one from another, and from thence have ascribed to 'em the use of the seminary Vessels of Men.* But they were deceived by the sight of the contorted Parts; whereas in *Tubes* dissected and blown up according to their Length, there is only one Cavity to be seen, distinguished with no Cells or Valves, and here and there somewhat unequally dilated.

Length. XXXII. *The capaciousness and length of these* Tubes *cannot certainly be describ'd, in regard that the difference of Age, the use of Copulation, and many other Accidents cause an extraordinary variety in these things.*

Through the *Tubes* therefore the spiritous part of the Male-seed injected into the Womb, is carried to the Stones, and the Eggs therein contain'd, and these Eggs again proceed from the Stones to the Womb. But how these come to the Womb through these narrow passages of the Egg-Chanel; this, tho' it be hard to be describ'd, yet by Similitudes it seems not difficult to be conceiv'd in the Mind, and explicated.

How the Eggs come from the Testicles to the Womb. XXXIII. *Many Fruits in their Seasons, as* Cherries, Damsons, Peaches, Walnuts, &c. *whose Seeds, which are like to Eggs, are brought to such a bigness and fitness, as to be impregnated, gape of themselves, and so those Seeds included in their Rinds (which Rinds at first stuck close to their Substance, but afterwards loosen'd from it) fall out of them; but so long as they cease to be irradiated and cherish'd by the dewie Moisture of the Earth, and the Influx of the spiritous Solar heat (which are to them like the Seed of the Male) they lye hid within their strong*

strong Shells or Cases; but when that enfertilizing Influx of the Earths Moisture, and of the Solar or other convenient heat, entring through the invisible Pores of the said Shells or Cases, has brought them to a greater perfection of Fertility; by and by those Shells or Cases grow soft in their Sutures, and so the Stones, tho very hard, open, and the Seeds included within grow moist and more juicy, and dilating themselves, quit the Stones, and so thrust forth the Bud, which is the first thing form'd in order to the new production. And the same thing happens in *Pease*, *Beans*, *Wheat*, *Barley*, *Melons*, *Cucumbers*, whose Seeds are wrapt up in a little Membrane instead of a Stone. In like manner Womens Eggs, and the Eggs of all Creatures that bring forth living Conceptions, as also of Birds, in their Ovary, by means of the Nourishment brought 'em through the small little Arteries and invisible Nerves, acquire a just bigness, and such an aptitude that they may be impregnated by the spiritous part of the Male-seed. Which Fertility if they acquire by Copulation, and so become seal'd with the Seal of Fertility, the little Cells wherein they are included in the Ovary, grow soft, dilate and loosen themselves (as the stones of Fruits, willing to quit their Seeds for new Production, open of their own accords) and so when they can no longer be contain'd in those little Cells by reason of their growth, and the loosning of the Cells, they fall of themselves into the Egg-Chanels or *Tubes*, which are relax'd to that degree by the increase of Heat and Spirits, in the Act of Copulation, that they afford the ripe Eggs an easie passage toward the Womb, which afterwards by the gentle Compression of the *Abdomen* caus'd by Respiration, are gently thrust forward through the *Tubes* into the Womb it self, wherein, by reason of the narrow Orifice of the Womb, they are stop'd and detain'd, there to be cherish'd by its moderate Heat and convenient Moisture, and the vivific Spirit latent therein, and infus'd with the Male-seed, may be freed from its Fetters, and proceeding from power to act, may begin the delineation of the Infant Structure. Of which more *Cap.* 28, 29.

How the Eggs come from the Testicles to the Womb.

A difficulty concerning the Wind-eggs in Women.

XXXIV. *Here arises a very singular and considerable Question*, viz. *When Birds, without the Coition of the Male, lay their perfect Eggs, (which they call* Wind-eggs*) whether mature Virgins, and Women depriv'd of Men, and without the assistance of Copulation, may not be able sometime to bring forth their Eggs?* 'Tis very probable that in Women of cold Tempers, and not prone to Venery, such Accidents will hardly fall out, seeing there is not in them such a copious afflux of hot Blood and Spirits, which is much promoted by intent venereal thoughts, to the generative Parts, that the little Boxes of the Ovary and the *Tubes*, should be sufficiently relax'd and dilated for the exclusion and passage of the Eggs: But in hot Women, itching with Lust, prone to Copulation, and continually intent upon venereal thoughts, sometimes the Parts may be so relax'd by a copious afflux of Blood and Seed to the Parts, that the Eggs, when mature, may drop of themselves into the *Tubes* out of the Ovary, and through them be carried to the Womb; yet not so as to be there long detain'd, because of the Orifice of the Womb's being open, as not being exactly shut, but when it contains the Man's Seed for Conception, or else the Birth. But why these same Womens *Wind-eggs* were never observ'd by any Person before, happen'd, I suppose, from hence, for that Women do not inspect what things slip out of their Wombs, or know what they are; nor will they suffer Men to view those things, among which, if there should be an Egg sometimes, it would not be discern'd by them. Besides that by reason of the tender Skin wherewith it is enwrapt, it might fall out broken, or else be broken among the Linen with which Women dry up their Uterine Excrements, and so lose altogether its shape of an Egg, which else would be visible to the Eye. However, in the mean time this has recall'd to my memory, what many years since a Woman, not of the meanest quality, whose Daughter being about four and twenty years of Age, wanton enough, yet honest, was troubled with vehement fits of the Mother, related to me; that is to say, That my Prescriptions, which were administred to her, nothing availing, her Midwife had many times deliver'd her from her present Distemper, and imminent danger of Death, by thrusting her finger into the sheath of the Womb; with which she kept rubbing there so long till she brought down a certain viscous Liquor out of the Womb, which was often accompanied with a certain clear transparent little Bubble, and so the

the Person in a Swoon came to her self again. This I laugh't at, at that time when I never so much as dream't of Womens Eggs; but afterwards it came into my mind, that that same Bubble was a *Wind-egg*, of which thing I could now give a better Judgment, could I meet with such a Bubble that were again to be seen. Moreover, it is very probable that those *Wind-eggs* are frequently evacuated by those salacious Women, who lying with Men, through some distemper of the Seed, never conceive: For why should their Eggs be less carried out of the *Ovary* to the *Womb*, than the Eggs of those of others that conceive? especially when they themselves have Eggs which are proper for Fertility, if they were but bedew'd with a fertile Male-seed? which is apparent from this, that some Women lying with their Husbands never Conceive, but lying with other Men presently prove with Child.

The opinion of Wind-eggs confirm'd.

XXXV. *This Conjecture of Wind-eggs is yet more confirm'd by that wonderful Story related by* Bartholine *of a* Norway *Woman, who after eleven kindly Labours, at length in the Year* 1639. *being in Labour with her twelfth Child, brought forth two Eggs with extraordinary Pains, like to Hen-eggs, only that the Shell was not so white.* Such another sort of Egg it was that the Woman brought forth, with the usual pains of Childbirth, in the Territory of *Vicenza*, in the Year 1621. by the Report of *John Rodias*, *Cent.* 3. *Observ.* 57. Without doubt the Female-seed contain'd in these Eggs, was either unfruitful, or which is more likely, by reason of the unusual thickness of the Exterior Membrane, the Male-seed could not penetrate through the over-straitned Pores, to the inner parts of the Eggs, and consequently not be mix'd with the Womans Seed latent within; and by that means could not frame any *Embryo* out of it self; for which reason those *Eggs* remain'd unfruitful like the *Wind-eggs* of Fowl living without their Males. Now there are three very remarkable things to be observ'd in the Eggs of the said Women. 1. That being little as they are, and sliding out of the *Tubes* into the Womb, they should stay there so long. 2. That they should grow to the bigness of a Hens-egg in the Womb. 3. That the Exterior Membrane should grow so hard, as to harden into a Shell; which is a thing scarce ever heard of, nor ever observ'd by any other Physicians that we read of.

The reason of the relaxation of the Tubes.

XXXVI. *We told ye before that the Egg Chanels or* Tubes *were so relax'd by the abundant flowing in of the Animal Spirits and hot Blood, that through them the spiritous part of the Male-seed might the more easily be able to penetrate to the Ovary and the Eggs; and the Eggs themselves might the more easily slip into them, be receiv'd by them, and hasten'd forward into the Womb.* Now that this is the true cause of this relaxation, no man will wonder, who has try'd how strait the Genitals of honest Women are, if that afflux do not happen; that is when they Copulate without any Lust, so that it is a trouble to 'em to receive the Yard: and then again, how loose they are, and with what pleasure they Copulate and admit the Yard, where that afflux plentifully happens; for I do not speak of *Curtizans*, who by the overmuch use, or rather abuse of Copulation, have their Genital Parts so worn and loose, that they can never be contracted and wrinkled again. He also that shall consider, how much the same afflux relaxes the Orifice and Sheath of the Womb, when a large and mature Birth, endeavouring to pass through those narrow passages, by its kicking and motion afflicts and pains those Parts, will easily confess the same. For then all those Parts dilate themselves: the former, to transmit the Eggs; the latter, to exclude the mature Birth; and that not being endu'd with any Art or Knowledge, but as being relax'd and mollify'd by a copious afflux of Blood and Animal Spirits, at that time flowing more to those parts than at other times, through the determination of the Mind. Which afflux afterwards ceasing, all those Parts so vastly relax'd, within a few days return to their pristine constitution and straitness.

Births conceiv'd and form'd in the Tubes.

XXXVII. *From what has been said, it is manifestly apparent that Eggs are carried from the Womens Stones or Ovaries through the* Tubes *to the Womb.* Which is confirm'd yet more by the Observations of some credible Physicians, by whom, in the dissections of Big-belly'd Women it has been found, that by reason of those *Eggs* being detain'd in the *Tubes*, through some unnatural cause, and not passing through into the Womb, that the Births were found in the *Tubes*, and found therein by dissection after Death; of which *Regner de Graef* brings some Examples out of *Riolanus*

Riolanus and *Benedict Vassalius.* Which tho' we look'd upon formerly as Old-womens Fables, now upon better knowledge of the *Eggs* and *Tubes*, we believe to be true.

This whole business demonstrated at the Theatre in Amsterdam.

XXXVIII. *Besides these Observations, this whole business was plainly demonstrated at the Theatre in* Amsterdam, April 15. 1673. *by Ocular Inspection, by the Learned* Frederic de Ruisch, *a most famous Physician and Professor of Surgery and Anatomy.* And this in a Woman, who in a short time after she had conceiv'd dy'd of some suddain Accident, of whom he thus writes: *Not only the* Tube *of the right, but also of the left side, were somewhat more ruddy, thicker, and more distended than usual, to the admiration of all the Beholders. The* Tube *of the right side was somewhat writh'd, toward the opening of the Ovary. The Womb, without any foregoing preparation, we cut up in the presence of a noble Company of Physicians: There we observ'd the Womb to be somewhat thicker than ordinary, more ruddy and more spungy, and its Concavity fill'd with a Lympid Liquor, upon which there swam the beginnings of a Birth, of a mucilaginous Substance, which rude Mass was afterwards so dissolv'd by the Air, that there was no footstep of it to be seen. In that same rude foundation of a Birth, I could not perceive any shape of Human Body. And therefore, whether that Foundation were an* Embryo, *or only an impregnated Egg, I much question. 'Tis also worthy observation, That the hollowness of the Ovary out of which the Egg had fallen, was not only of a deep red colour, but also spungy, as we find in the Womb, the Birth being newly deliver'd: so that to me the Egg seems to be cherish'd in the Ovary, as the Birth in the Womb. Moreover, I cannot but wonder at what I find also in other ingravidated Bodies, why both the Spermatic Veins, are so much wider than the Arteries: For if the Arteries should exceed the Veins it would be no wonder, seeing that the Birth requires much Nourishment. I found the Orifice of a Womb not closely shut within, as some Authors will have it, but gaping more than usually,* &c.

How the Substance of the Ovary becomes spungy and open.

XXXIX. *From this demonstration we may clearly be convinc'd, not only how the Substance of the Ovary, ready to quit the Egg, becomes spungy and open, but also how the* Fallopian Tubes, *carrying the Egg from the Ovary to the Womb, at that time became more thick and patent.* But why the Spermatic Veins running through the womb, exceed the Arteries, we shall give the Reason *Cap.* 27. but why he found the Orifice of the womb gaping at that more than usual rate, is beyond mine and the common Observation of other Anatomists. Only this may be said, That being open'd to receive the Egg into the womb but a little before, the suddain approach of Death gave it not leisure to close again; or being relax'd by the suddain and disorderly Commotion of the Spirits, continued open.

Three things to be consider'd in Womens Eggs.

XL. *In a Womans Egg (for I speak not of the Eggs of Brutes) three things are to be consider'd:* 1. *Its External little Skins, which after Conception constitute the* Chorion *and* Amnion. 2. *The plentiful Humours or Liquors contain'd in those little Skins.* 3. *The small Crystalline Bubble appearing in a fertile Egg already conceiv'd in the Womb.* Of all which in their due places.

Whence the pleasure of Copulation.

XLI. *After this History of Eggs, one doubt remains; that is, If the Eggs are carried through the* Tubes *into the Womb, and nothing else of Seed flows from the Stones, whence proceeds that pleasure which Big-belly'd Women have in Copulation, at what time no Eggs are carried anew to the Womb, in regard the Extremities of the* Tubes *are so exactly shut? as also in such as have their Womb cut out for the cure of some Disease, particularly the falling down of the Womb? Also in Women of fifty, who cease to have any more Eggs in their Ovaries? Moreover, whence proceeds that Seed which flows from Women in Copulation into their Sheath, and bursts forth in the Night in Lascivious Dreams?* I answer, That that same great pleasure in Coition does not arise from the Eggs passing from the Ovary to the womb, but rather from the Eruption of that Seed (if it may be called Seed) which proceeds from that glandulous Substance encompassing the Bladder, which Seed is equally in Big-belly'd and Empty-belly'd grown women, and in such as have their wombs cut out, and may break forth with Pleasure into the Sheaths, as well in Nocturnal Dreams as otherwise. But we must understand that the pleasure of

women

women in Copulation, proceeds not so much from the bursting forth of the said Seminal Matter into the *Sheath*, as from the rubbing of the *Clitoris*, as it is with Men by the rubbing of the Nut.

Whether Women may be castrated, and have their Stones cut out?

XLII. *There remains to be enquired, Whether Women may be castrated, and have their Stones cut out? I answer, That Women cannot be castrated without great hazard of their lives: for the small Guts must be cut on both sides, which is very hazardous, in regard that upon the least wound of the* Abdomen, *and especially of the small Gut penetrating the* Abdomen, *the Guts presently burst forth. Which wounds in this case must be of a good bigness, for the fingers to be thrust in, the Guts to be remov'd, to the end the Stones may be found and brought forth.* Besides, upon the cutting off the Stone, the Spermatic Vessels are also cut away, from whence it would be very hard to stop the flux of Blood into the lower Belly; which appears from hence, that it is a hard matter to stop the blood in men, whose Vessels may however be much more conveniently bound or cauteriz'd. For tho', as *Galen* testifies, Sows might be spay'd in *Cappadocia* and *Asia*, and the same thing be practis'd among the *Germans* and *Westphalians*: though Bitches in the same manner may be spay'd; yet the cutting out of womens Stones is not to be attempted with like security; for Mankind is not to be expos'd to the same dangers with brute Beasts, among which many of the Females dye when spay'd. And therefore I wonder that *Platerus*, a man of great Judgment, should think that women might be spay'd as easily as brute Beasts, not considering the difficulty and cruelty of the Operation, accompanied with a thousand hazards, which enjoyn all men, especially Christians, to abhor such a wicked piece of Villany. Tho' Histories assure us that it was a Cruelty most barbarously and ignominiously practis'd upon women in former Ages. The *Creophagi*, a People so call'd in *Arabia*, as *Alexander ab Alexandro* testifies, not only gelt their men, but castrated their women, according to the Example of the *Egyptians*, who were wont to spay their women in that manner. *Xanthus*, cited by *Athenæus*, relates that *Adramytes* King of the *Lybians*, spay'd his women, and made use of 'em instead of Eunuchs: and *Hesychius* and *Suidas* accuse *Gyges* of the same Crime.

Another sort of Castration.

XLIII. Wierus *makes mention of the other sort of Castration, by cutting out a womans womb, by which she is made unfit for Conception; which he relates fell out very successfully to a certain Sowgelder, who suspecting his Daughter to be guilty of Adultery, spay'd her by cutting out her womb.* But this way of Castration is no less hazardous than the other.

CHAP. XXV.

Of the Womb and its Motion.

HAving explain'd the Parts that serve for the making and evacuation of the Eggs and Female Seed, we come now to those where Conception is finish'd, that is to say, the womb and its several parts.

The Womb.

I. *The Womb, which is also call'd* Matrix, *and* Vulva (*by the Greeks* ὑστέρα *and* μήτρα, *and sometimes* γαστὴρ) *is an organic part serving for Generation, seated in the middle of the* Hypogastrium, *between the Bladder and the right Gut, in the strong* Pelvis, *form'd out of the* Os Ilium, *the Hip-bone, the Share, and* Os Sacrum. Which *Pelvis* is larger in women than in men. And in time of Labour, the strong Ligaments about the *Os Sacrum*, and *Os Pubis*, being loosen'd, and the *Coccyx*, or last portion of the Back-bone giving way, may yet be further stretch'd to release the Birth out of the straits of the Uterine Prison.

Its Situation.

Its Substance.

II. *The Substance of it in Virgins is white, nervous, thick, and compacted: in women with Child somewhat spungy and soft.*

Its Membrane.

III. *It has two Membranes. The outermost doubled and strong from the* Peritonæum; *smooth, and smear'd over with a watery Humour, by means of which Membrane it is fasten'd to the* Intestinum Rectum, *the Bladder and the adjacent lateral parts. The innermost, which is proper to it, is fibrous, and more porous, rising from the inner substance of the womb, and firmly fasten'd to it, rough in the larger Cavity, about the Neck, full of wrinkles or furrows, and full of little Pores.*

IV. *But*

The ſpace between the Membranes.

IV. *Between theſe Membranes is found a fleſhie and fibrous Contexture, which in Big-belly'd women, by reaſon of the great quantity of Nutritive Humours flowing to it, ſwells together with the ſaid Membranes, ſo that the more the Birth grows and increaſes, the more fleſhie, fibrous and thicker the womb grows, which in the laſt Months of a womans Time equals the thickneſs of a Thumb, and ſometimes of two fingers.* Neither does this thickneſs proceed from the Humours penetrating into the Poroſities of the womb, as many believe; but is a real thick fleſh, which afterwards, like Muſcles, ſerves for the expulſion of the Birth.

Such a ſort of fleſhie Subſtance of the womb in *Novemb.* 1653. I publickly ſhewed in our *Anatomy Theatre*, in the body of a woman dying in Childbed, twelve hours after her deceaſe; and not long after in another woman that dy'd in Labour, together with the Child. But this ſame increas'd fleſh, after the birth is deliver'd, the blood and humours flowing out preſently with the Birth, or afterwards, drys up again, and ſo the womb returns to its priſtine ſhape and bigneſs.

The bigneſs

V. *The bigneſs of the womb is not very conſiderable; but varies according to Age, and the uſe of Copulation.* In Virgins it is about two fingers in breadth, but ſeldom above three fingers in length; which bigneſs is ſomewhat extended in thoſe that make uſe of men, and is ſtill bigger in fruitful women that have born many Children. How far it increaſes in Big-bellied women is known to every body.

Its weight.

VI. Regner de Graef *diſtinguiſhes its bigneſs according to the difference of Age, by weight.*

In new-born Children, ſays he, *we have obſerv'd the womb to have weigh'd a dram, and ſometimes a dram and a half. In old Women and Virgins growing Ripe, it is of that bigneſs as to weigh from an Ounce to an Ounce and an half. In ſtronger Women, that have had many Children, and uſe frequent Copulation, it ſeldom exceeds two Ounces.*

But a moſt monſtrous and diſeas'd womb was that which *Regner de Graef* in the ſame place tells us took up the whole Concavity of the *Abdomen*, and weighed at leaſt *forty pounds.*

Its ſhape.

VII. *The ſhape of it reſembles a Pear, or rather a Surgeons* Cucurbit; *in Virgins ſomewhat flat before and behind; in ſuch as have had Children, more round.*

Its hollowneſs.

VIII. *The hollowneſs of it is but ſmall, as being no more than in women not with Child, eſpecially in Virgins, and will contain a good big Bean; but after Conception increaſes and dilates it ſelf with the whole womb.* This is not diſtinguiſh'd with any Cells, as in moſt brute Beaſts that bring forth living Conceptions; but only by a ſuture, or rather certain Line extended in length, and drawn along only in the inner part of the fleſhie Tunicle, and ſo by it is divided into the right and left part; like the Line which appears in the outſide of the *Scrotum* in men. Which Concavity however is ſo order'd, that it is not equal and altogether round, but toward the right and left ſide. As it were extended into a Horn, being ſomewhat longer toward the little Orifice or Mouth of it, ſo that it is almoſt Triangular. It is very rarely ſeen that this Cavity is divided by a middle Separation, tho' *Riolanus* brings two Examples of ſuch a Diviſion. In this Cavity there ſettles for the moſt part an oily kind of Liquor in empty women, defending that ſecret Shrine of Nature from Drought, and preſerving it prepar'd for neceſſary Fruitfulneſs.

The Horns.

IX. *Thoſe parts that ſeem ſomewhat to ſwell from the ſides of the bottom, are call'd the* Horns of the Womb. *But theſe are more manifeſt in Beaſts that bring forth living Conceptions, whoſe Womb being parted into two parts, is divided into two apparent and long Horns, diſtinguiſh'd within-ſide into little Cells. But it is ſeldom ſeen that ſuch Horns are found in Women, as* Silvius *found in a certain Maid, and of which* Schenkius *cites the Example out of* Bauhinus, *Obſervat. l.* 4. *Riolanus* refuſes to call theſe Horns the ſwelling Extremities of the womb, but the *Tubes*; wherein *Van Horn* and *Swammerdam* ſeem to take his part. But what is vulgarly aſſerted concerning theſe Horns, my opinion is, ſhould rather be underſtood of the womb it ſelf, than of the inner Cavity of the womb: For a womans womb is not horned, but truly round and ſomewhat flat. But its Concavity is extended both to the right and left, after the

manner of a *Horn*, as is manifest by the Dissection of it.

Its connexion.

X. *It is fasten'd to the neighbouring parts by the neck and bottom. The neck by means of the* Peritonæum, *is fasten'd before to the Piss-bladder and the Share-bones, behind to the* Intestinum Rectum *and the* Os Sacrum; *and about the Privity joyns with the* Podex, *looſely adhering at the sides to the* Peritonæum. The bottom, as to its own Substance, is fasten'd above to no part, that its extension may be the freer.

Its Ligaments.

XI. *At the sides it hangs ty'd with two pair of Ligaments. Of which the* first, *which is the uppermost, resembling in shape the wings of Bats, is strong, broad, membranous, loose, soft, and being interwoven with fleshie Fibres, proceeds from the* Peritonæum *doubled in that place (whence* Vesalius *and* Archangelus *imagine both parts of the sides to be so many Muscles) and being fasten'd to the* Tubes, *Stones, and Protuberances of the bottom, joyns the Matrix to the* Ossa Ilii, *which being immoderately looſen'd or broken by any outward violence, the Womb descends into the Cavity, and sometimes slides forth*; at least, if the Substance it self of the womb become loose also through any Accident; which tho' in perfect health it be thick and compacted, in a sickly Constitution of body it relaxes, like the *Scrotum* in men.

The opinions of Soranus *and* Aretæus *about the falling down of the Womb, refuted.*

XII. Soranus *and* Aretæus *assert, That not the whole womb, but its internal fleshie Tunicle only, with the primary Substance of the womb, slips down to the Groyns, the outward membranous Tunicle, which is firmly fasten'd to the neighbouring parts remaining whole.* But because this Opinion presupposes a wonderful dilaceration of the body of the womb into two parts, the outermost and innermost, which is altogether impossible, it is to be held for most certain that the innermost fleshie Membrane of the Womb, cannot descend into the Fall, but that of necessity the whole body of the womb, turn'd upside down, slides from its place.

Whether the Womb can fall.

VIII. *This falling down of the womb, by all Physicians hitherto granted,* Theodore Kerkringius *an eminent Anatomist, now strenuously denies; and writing upon that Subject, bitterly inveighs against* Andrew Laurentius, Vesslingius, *and* Bartholine, *as if they, among others, had erroneously judg'd of this matter, and says that a certain Relaxation of the Neck, which hangs forth without the Privity, causes all these idle Mistakes.* But let the learned Gentleman recant his words; for, because he never saw a fall'n womb, he over-rashly and petulantly derides others that have been eye-witnesses of the thing; and most excellent Physicians, as to that matter, both in Practice and Theory, much more skilful and conversant. Let him read in *Carpus*, the Story of a woman whose womb did not only slip down without the Privity, but was also cut away. Let him read in *Paræus* the Example of a womb fall'n down, and cut off by *Paræus* himself. Let him also read *Hildan's Cent.* 4. *Observ.* 60, 61, 62. where he will find three Examples of a womb fall'n down, related by a Person of exact Credit. Let him read *Dominic de Marchettis*, *Anat. c.* 7. that he himself three times saw a womb fall'n, replac'd it, and cur'd it. Let him read many more such like Examples in *Avenzoar*, *Matthew de Gradibus*, *Nicholas Florentinus*, *Benivenius*, *Christopher a Vega*, *Paulus Ægineta*, *Mercurialis*, *Botton*, *Licet*, *Sennertus*, and others. All which Persons, and many others, were not so stupid, nor so blind, but that they knew a womb when it was fall'n. To these let him add my own Testimony, who in a certain young woman saw her womb hang out of the Cavity to the breadth of two fingers, which I handled with my own hands, and with a proper Instrument thrust back into its place, and afterwards so well cur'd the Patient, that the same part never fell afterwards. Besides that, all that has been said is yet more confirm'd by the Doctrine of *Hippocrates*, who *Lib.* 2. *de Morb. Mulier.* and in several other places plainly teaches, that the womb does sometimes slip forth, and also adds the Causes and the Cure of such a falling down; with whom *Galen* also agrees. Reason also confirms the Experience of this thing: For if a copious affluency of cold Humours may so relax the little joynt of the Hip, that the head of the Thigh-bone shall fall out of its Cavity, call'd *Acetabulum*, what wonder is it that an affluency of the like Humours should so relax the womb it self, and its Ligaments, that not being able to restrain it, the womb should fall

fall down? Hence we find that the ſame Accident happens in moiſt places, eſpecially to women that are of a cold and moiſt Temper, and troubled with a redundancy of flegmatic Humours, in which the womb ſometimes deſcends to the Orifice of the Privities, and ſometimes ſlips down all of it without.

As to what *Kerkringius* ſays, That it is not the womb it ſelf, but a certain relaxation of the Neck or Sheath; I would ask him this Queſtion, Whether the womb remaining in its proper place, the *ſheath* can be ſo much extended downward as to hang forth without the Privities? And therefore for the future, as to thoſe things that he has not ſeen, let him believe thoſe that have.

Whether the Womb be inverted in the fall.

XIV. *Here another Queſtion ariſes, Whether the Womb in the fall be turn'd upſide down? That it muſt of neceſſity be inverted, and cannot otherwiſe ſlip forth, Reaſon teaches.* Yet *Regner de Graef* thinks this impoſſible in Virgins, by reaſon of the extraordinary narrowneſs of the Uterine Orifice. But that it is poſſible only in Child-bearing women, when the *Secundine* ſticking too cloſe, is over-violently pull'd by an unskilful Midwife. Indeed I believe it to be true, that the womb rarely falls in Virgins; but that it happens to other women at other times than when they bear Children, I my ſelf have ſeen; for which I could produce the Examples of many honeſt women, if Modeſty would permit me: And therefore let the Example by me already alledg'd ſuffice, where the womb hung forth of the womans body inverted.

The other pair of Ligaments whence they proceed.

XV. *The other lower pair of Ligaments, round like Worms, ſomewhat ruddy, proceed on both ſides from the ſides of the Womb like Muſcles, and ſo deſcends to the Groyns; (whence* Riolanus *thought the Womb to be wrapt about with the Cremaſter Muſcle, and* Veſalius *calls 'em the Muſcles of the Womb) then paſſing through the doubled Production of the* Peritonæum, *and the Tendons of the oblique Muſcles of the* Abdomen *are preſently ſtrengthen'd with fleſhie Fibres proceeding from the* Os Ilium, *and being reflex'd above the Share-bones, approach the Clitoris, and there end.* Some Anatomiſts aſſert, That the remaining part of this Pair is extended farther into the fatty internal Membrane of the Thigh, and with that deſcends to the Knee, or according to ſome, deſcends to the Foot; which *Riolanus* thinks to be the reaſon why women in the firſt Months of their Breeding complain of pains within their Thighs. But they were deceiv'd, in not obſerving that the ſaid Membrane being extended to the Knee, does not proceed from the Lumbrical Ligament, nor has any communion with it, but that it plainly ariſes from the Cartilaginous Ligament of the *Os Pubis* or Share-bone. Theſe Ligaments looſly bind the bottom of the womb in the parts before and behind. *Bauhinus* obſerving looſe Pores within 'em, and ſometimes a kind of viſcous Humour in the lower part, believ'd that they ſerv'd for two uſes; partly to do the office of Ligaments, partly to evacuate through thoſe Pores the ſuperfluous Humours of the Genitals. *Spigelius* likewiſe obſerving that viſcous Humour, judg'd it to be the Seed, which in women, as to ſome part of it, is carried through theſe Ligaments, which he thinks to be the true *Vaſa Deferentia*, to the *Uterine Sheath* and the *Clitoris*. The ſame viſcous Humour after that led me aſtray into *Spigelius*'s Opinion, from which afterwards I revolted for the Reaſons mention'd in the foregoing Chapter. *Veſlingius* dreamt that beſide the Seed ſomething of uncleanneſs gather'd about the womb, and was evacuated through theſe Ligaments; which nevertheleſs is altogether impoſſible, in regard they have no hollowneſs capable to tranſmit both Seed and ſuch an excrementitious filth: neither is it probable that thoſe two Subſtances are ever mix'd or flow together through any other paſſages, ſeeing that the Seed muſt of neceſſity be contaminated and corrupted by that naſtineſs. Erroneouſly therefore does *Andreas Laurentius* aſſert, That theſe round Ligaments are ſometimes ſo dilated, that they cauſe the Rupture call'd *Bubonocele*; notwithſtanding that they can never be dilated ſo wide as to receive the Inteſtine or Caul. But the Rupture *Bubonocele* is occaſion'd in women as in men, that is, when the Gut or Caul ſlides down into the dilated or broken Production of the *Peritonæum* wrapt about theſe Ligaments, and accompanying and embracing 'em without the *Abdomen* to the Grovns, as in men it includes the Spermatic Veſſels within it ſelf.

Its Veſſels.

XVI. *The Womb is furniſhed with ſeveral Arteries and Veins, far more numerous and bigger, and more winding than the* Sheath. *Nevertheleſs the*

Arteries are much more numerous than the Veins, for the Veins are very few, in respect of the Arteries; and those chiefly dispers'd thorough the outward parts of the womb. Whence that of *Aristotle*, that *from the greater Vein, no Vein is deriv'd to the womb, but from the* Aorta *many and very thick.* But in these words the Philosopher does not deny but that some Veins run along thorough the Superficies of the womb; which every man that has eyes may see; but he means that very few or none of those Veins enter the inner Substance of it, but many Arteries do it.

Arteries. XVII. *The Arteries that creep through the upper part of it, descend from the seminal Vessels before they form the* Vasa præparantia, *or preparing Vessels: But those which disperse themselves through the middle and lower Part, proceed from the crural and hypogastric Vessels of the same Artery.* There is such a Conjunction of these Arteries, that they can hardly be distinguished one from another, by reason of their Ends gaping into Branches both of the one and the other: When the *Spermatic* or *Hypogastric* Arteries being fill'd with Breath, presently the Arteries of the other side, for the most part swell together, at least in the same manner as the Arteries of the Sheath.

Veins. XVIII. *The upper Veins ascend to the* Vena Cava, *and empty themselves into it near the Emulgent: the lower enter the* Hypogastrics.

The upper Arteries are vulgarly said to meet together with the upper Veins, and the Lower, with the lower Veins, by various *Anastomoses*: But as yet I could never observe those *Anastomoses*: This only I observ'd, that the little Veins arising from the Substance of the womb, are intermix'd one among another, and mutually open one into the other; but that none are conjoyn'd with the Arteries by *Anastomoses*; and so that the Arteries only meet here and there by *Anastomoses*.

For the Arteries with their Orifices enter the very Substance of the womb, into which they pour their Blood, which is every way distributed therein through winding Chanels and little Pipes: which some thought to be the Cavities or Glandules called *Cotyledons*, to which, in Conception, the *Placenta* or *Uterine* Liver sticks, in which at that time they gape, and pour Blood into it to be prepared for the Nourishment of the Birth; and also contribute copious alimentary Blood to the very spungy Substance of the womb, seated between both Membranes, the which causes the womb at that time to swell to a bigger Bulk, and so as the Birth grows, the womb's Habitation also swells. To which end at that time large and turgid Vessels are to be seen, by reason of the plenty of Blood which they contain more at that time than before Conception.

The cause of the flowers. XIX. *For at such time as women are not with Child, the Blood which superabounds every Month at certain Periods, is forc'd in great quantity through the Arteries to the womb, with a certain kind of Effervescency; and when as there are but few Veins in the inner Substance of it, through which the Circulation of so much Blood can be conveniently made, and the Orifices of the said little Pipes are now soft and smooth, hence it comes to pass that the redundant Blood, which by reason of its quantity cannot be suddainly circulated, as being superfluous and troublesom to Nature through its quantity, flows forth through the gaping and open Orifices of the Pipes, also through the ends of the Vessels ending in the neck of the womb.* But in such women wherein those little Pipes are closer shut, in them their flowers flow only through the ends of the Vessels ending in the Neck or *Sheath* of the womb; or else stop, if that fermentative quality be not yet come to such a perfection, as to raise such an Effervescency in the Blood.

What is the Uterine Ferment. XX. *Now what this Uterine Ferment is, and where it is generated, which provokes that Effervescency of the Blood at prefix'd monthly periods in empty women, but very seldom in women with child, has been but little inquired into as yet.* We shall suspend our Judgment in this particular, by reason of the obscurity of the thing; and yet we leave it to be consider'd, whether the fermentaceous Matter in the Spleen, Liver, Sweetbread, and Glandules and other parts, and carried with the Blood through the Arteries to the womb, and there some part of it being left, and collected together by degrees (for you shall always find a viscous slimy Humour in the dissected wombs of empty women) gains

gains some peculiar quality, from a certain specific property of the womb, which provokes that specific fermentation (as the same Matter is endu'd with a peculiar quality in the Stomach, to extract the *Chylus* out of the Nourishment) by means of which, that Humour in healthy People being matur'd to that volatility in a Months space, to boyl of it self, the whole body of the woman, but especially those parts next the womb are put into a Commotion, and the superfluous or boyling blood, dilating the swelling Orifices of the Vessels, is thrust forth; and that same quality or just volatility of the said fermentaceous Humour ceasing, the menstruous evacuation also ceases; as in women with child, and women that have lain long sick.

Aristotle's Opinion.

XXI. Aristotle *not understanding this ferment of the womb, and the thence proceeding effervescency of the Blood, asserts that womens flowers are provok'd by the influence and motion of the Moon.* Which Opinion, with his leave, stands upon no Foundation, or rather is plainly contrary to Reason: for according to that Opinion, all women would have their flowers at the same time, and they would only flow at that certain time, wherein the Moon being mov'd to that determin'd point of Heaven, caus'd that specific influence; whereas during the whole monthly Course of the Moon, there is not any day, nor any hour, wherein here and there over the whole world innumerable women are not troubled with their flowers.

Whether from the redundant blood?

XXII. *Vain is also their Opinion, who believe the monthly Courses to be mov'd by the redundant blood collected in the Vessels of the womb; in regard those Vessels are not able to contain so great a quantity of blood as is evacuated every period.* Or if they should collect it by degrees, and so reserve it for a Month, they must be strangely swell'd, whereas it is apparent by inspection in dissected Bodies, tho' plethoric, dying at the very instant of their monthly evacuations, or when it began to happen, that there appears then no more unusual swelling of the womb than at another time. Add to this, that in lean women frequently given to fast, in whom there is no such redundancy of blood, nevertheless the flowers have their usual Course. Lastly, the continual circulation of the blood does not permit such a stagnation in the Vessels of the womb, which if it should happen, the blood would there be in danger of a suddain Putrefaction, and would afflict the woman long before the time of her Evacuation with most terrible Symptoms and Effects; whereas the menstruous blood is not putrid, nor differs in it self in goodness from the rest of the blood. This is confirm'd by the testimony of the fam'd *Hippocrates*. *But the blood*, says he, *gushes out as from a Sacrifice, and is quickly congeal'd, if the woman be healthy.* Which *Aristotle* also asserts in these words; *And those which are call'd flowers gush forth, which is as it were the blood of a Creature newly kill'd.* I say, *of it self*; because, if in some it be vitious, sharp, noysom to the smell, or otherwise corrupted when it is evacuated, it has not that imperfection in it self, but contracts it from the vitious nastiness bred and remaining in a distemper'd and sickly womb, or else at the time of the menstruous Effervescency flowing from other parts to this same Sink, together with the blood, and vitiating the blood by its mixture. And this is the meaning of *Hippocrates*, where he says, *and it corrodes the Earth like Vinegor, and gnaws whereever it touches the woman, and exulcerates the womb.* Certain therefore it is that the monthly Courses are provok'd into motion by the foresaid Effervescency of the blood fermenting in the Vessels of the womb. Which Effervescency, if sometimes it be occasion'd, not by the foresaid Uterine ferment alone, but by other Causes, then sometimes it happens that the Courses are still in motion beyond the ordinary Period, as often happens in the *Small Pox*, *malignant and burning Fevers*, &c.

What is the Uterine Ferment.

Nerves.

XXIII. *There also belong to the upper parts of the womb small little Nerves, rising from the inner Branch of the sixth Pair; to the middle and lower parts, little Branches proceeding from the Nerves of the* Os Sacrum.

Its Office.

XXIV. *The office of the womb is to receive the Seed of the man, and to preserve and cherish the womans Eggs, till the Birth be form'd, and being brought to maturity, and wanting more Air, to thrust it forth into the world.* Moreover, it is ordain'd for another secondary use, that is, the Purgation of the womans body. Which two offices, *Aretæus* comprehends in three words: *A womans womb*, says he, *is useful for Birth and Purgation.*

XXV.

Whether necessary for life.

XXV. *The womb is therefore a part necessary for Generation; but thence there is no Conclusion to be drawn, that it is a part necessarily conducing to the life of a woman; seeing that a woman way live without a womb; as is apparent in them, whose womb slipping out, is not only ulcerated and corrupted by the external cold, but also cut out, and yet upon the growing up of a Cartilaginous Substance consolidating within the hole of the womb cut off*, the same women have liv'd in health for many years; and more than that, have lain with their Husbands, and almost with the same pleasure, as if they had a womb; of which there are sundry Examples cited by several Physicians of great Reputation.

Whether it forms the Birth.

XXVI. *But seeing that the womb is a part most necessary to Generation, wherein the Conception ought to be made, and the Birth form'd, the Question is, Whether by any specific power or faculty the forming of the Birth be there brought to perfection.* To which I answer Negatively; for that the forming power is in the Seed, and the womb contributes no more to the Generation of Man, than the Earth to the Generation of Plants; that is to say, it affords a secure Harbour for the Seed and the Eggs; temperate and sufficient nourishment.

Whether the Birth may be form'd out of the womb.

XXVII. *Now tho' it were held for a thing undoubted and unquestionable by all the Ancients without exception, that the Office of conceiving wholly belong'd to the womb, and that the Birth could not be conceiv'd any where out of the womb; yet in this Age it has been discover'd and observ'd by famous Men, tho' it rarely happen, that the Birth has been conceiv'd in the Uterine Tubes.* But that same Story seems incredible related by *Philip Salmuth*, of a certain man that ejected his Seed by a Lip Copulation into his Wives mouth, who upon that conceiv'd a Child in her Stomach, and afterwards vomited it up as big as ones finger: as if a Child could be conceiv'd out of the Seed of the man without the womans Egg; and that in the Stomach too, full of fermentaceous Juices and Aliments to be concocted. I admire that *Philip Salmuth*, a Learned Man, should give so much credit to an old Womans Fable, as to think it worthy to be inserted among his Observations. Nor does that Story of a Child born at *Pont a Mousson*, conceiv'd and form'd in the middle of the *Abdomen*, and found there after the death of the Mother, deserve more credit. Which Story was printed by *Laurence Strasius* at *Dormstadt*, in the Year 1662. with the Judgments of several famous Physicians and Professors upon it: Which Story I know not how it can be true, unless you will say, that perhaps the Egg being before impregnated by the dew of the Male-seed in the *Ovary*, and ready to fall out of the Stones into the *Tubes*, coming by chance to the Borders of the *Tubes*, should slip into the Cavity of the *Abdomen*, before its entrance into the *Tube*, and so by the cherishing heat of that place the Birth should be form'd therein: which nevertheless seems very improbable; and therefore such Stories as these not without reason, are derided and exploded by the Learned *Guido Patinus*, *Bartholine*, and others.

The Motion of the womb.

XXVIII. *Concerning the motion of the womb, there is a famous Question started, whether it ascend or tumble to and fro, as it is said to do in the* Hysteric Passion, *or Fits of the Mother.* The affirmative part is defended by *Aretæus*, *Fernelius*, *Laurentius*, *Spigelius*, and especially by *Daniel Sennertus*, who *Prax. l. 4. part. 1. sect. 2. c. 15.* cites and applauds the Opinions of the foresaid Physicians as infallible Oracles, and makes a great addition of farther Proof; and rejects the contrary Opinion of *Galen*, as altogether repugnant to truth. Now the Reasons that perswaded those Learned Men into the affirmative, were chiefly these two:

1. The Perswasions of idle women, who affirm that they not only perceive it within the Globe of the womb as big as a Goos-egg, ascend in the *Hysteric Passion* as high as the *Diaphragma*, but also feel it outwardly with their hands; nay, some are so confident as to tell you, they feel it as high as their Throats. *Fernelius l. 6. patholog. c. 16.* writes, That he, being induc'd by the Complaints and Intreaties of the Women, has sometimes felt it with his hand carried up into the Stomach like a little Globe, by which it has been strangely oppress'd.

2. The Fumes; because that in the *hysteric Suffocation*, stinking Smells held to the Nostrils, either diminish or take away the Effect; but sweet Smells exasperate and bring the fit. Of which the first they say proceeds from hence, because the

the womb, which is endu'd as it were with a ſort of reaſon, flies ſtinking ſmells, which being held to the Noſe, it preſently deſcends to avoid 'em. The latter, becauſe it is delighted with ſweet ſmells, and therefore if they be apply'd to the Noſtrils, it preſently aſcends to meet 'em. And that which ſeems to confirm this Opinion the more, is this, becauſe the ſame ſweet things being rubb'd about the inſide of the Privity, immediately abates the fit; becauſe the womb, as they ſay, deſcends to thoſe things with which it is delighted.

From whence they conclude, That the Womb aſcends with a ſpontaneous Motion, and may be mov'd any way; nor ought that to be wonder'd at, ſay they, when its Motion upward in Women with Child, and downward in the falling of the Womb, is a thing ſo well known.

Theſe Reaſons were thought to be of ſo much weight by many, that they led men of great repute into the Labyrinth of Error. But on the other ſide, That the womb does not aſcend upward of its own accord, nor is mov'd with a wandring Motion through the lower Belly, may be demonſtrated by ſeveral Reaſons.

1. The Ligaments prevent it; not only the *Vermiform*, thoſe in the ſhape of a Worm, but chiefly the *Lateral*, like to the Wings of Batts, which are ſo ſtrong, that they can by no means ſuffer ſuch a ſuddain Extenſion. Add to this, That the *Uterine Sheath* is alſo firmly faſtened to the neighbouring parts, the Bladder, the right Inteſtine, the Privity, *&c.* All which parts in the aſcent of the womb, would be likewiſe drawn up together toward the upper parts with great pain and trouble; and yet we never hear thoſe that are troubled with fits of the Mother, ever complain of any ſuch painful Attraction.

2. The womb is ſo ſmall in empty women, that it cannot extend it ſelf to the *Diaphragma*, tho' it ſhould be violently dragg'd up by the hand; or attenuated by extraordinary Extenſion into the thinneſt Membrane that can be.

3. In a Woman with Child, tho' it be large, yet no rational man will ſay, that in an *hyſteric Suffocation* the womb with the birth included in it, is able to aſcend to the *Diaphragma* and the Throat.

4. In the diſſected Bodies of thoſe that have dy'd of the *hyſteric Paſſion*, of which I have diſſected many, I have often obſerv'd that neither the womb was ſwell'd, nor any way remov'd out of his place, tho' while they liv'd, at the very laſt gaſp they have complain'd extreamly of its aſcent to the *Diaphragma*, and their very Throats. Nay more, in the ſaid Diſtemper I have rarely met with any fault in the womb, but have found it in one or both Stones.

What aſcends or riſes up in fits of the Mother, is not the womb.

XXIX. *The Globe or Subſtance which is ſaid to aſcend from the lower Belly to the Stomach and higher, is not the Womb, nor, as* Riolanus *believes, the* Stones *or* Tubes *of the Womb, ſwelling with putrify'd Seed, and violently agitated up and down; for thoſe parts are not ſo looſe nor ſo bigg, as to aſcend above the Stomach, or to be felt, as big as a Hen or a Gooſe-egg; but the Inteſtines or Guts, which are ſtruck and torn by ſome malignant and ſharp Vapors, aſcending from the Womb or the Stones; as in the Epilepſie, a ſharp malignant Vapour ariſes from the great Toe, or ſome other part, to the Head, and there by its Vellication cauſes an unuſual and vehement Contraction of the Nerves.* Now this pain in the Guts being communicated to the Senſe in the Head, preſently to repel the Miſchief, and exclude the Cauſe, a great number of Animal Spirits are poſted into their Fibres, by the ſwelling of which the Guts are contracted, and then if there be any wind in the Guts, as generally there is, they contract themſelves about that wind, and by compreſſing and ſqueezing it together, make that ſame Globe. And thus by the Acrimony of the ſame Vapour aſcending higher, the *Diaphragma*, the Muſcles of the Throat and Jaws, and other parts, are contracted by the copious influx of Animal Spirits, whence proceeds that Suffocation. Nor does the hard binding of a broad Swathe or a long Napkin about the belly avail in ſuch a caſe, to hinder the aſcent of that ſame Subſtance or Globe which women take to be their womb, any otherwiſe, than only becauſe that by means of that hard binding, the copious aſcent of that ſharp malignant Vapour, ariſing from the womb or ſtones, is hinder'd, which Vapour being then detain'd below that Ligature, is diſſipated by the heat of the ſurrounding parts.

XXX.

Whether Hysterical Effects arise from the Sweetbread Juice?

XXX. *Here by the way we are to take notice, that* Francis de le Boe Sylvius, *with whom* Regner de Graef, *agrees in this Particular, does not acknowledg the forementioned cause of the Hysteric Passion, but has imagined another quite different; that is to say, that the Fault of the Pancreatic Juice is the only cause of the Hysteric Symptomes aforesaid, and so most couragiously rejects the Opinions in this case of all the antient and most of the modern Physicians, and excuses the Womb and spermatick Parts from being the Occasion of those Symptoms.* But altho' some Symptoms having as it were some Similitude with some hysteric Effects, may sometimes be occasioned by the defects of the Pancreatic Juice, which I am unwilling altogether to deny, yet by diligent Observation they may be sufficiently distinguished one from the other, and I my self have obsery'd 'em no less in Men than in Women: nevertheless always to accuse the unfortunate Pancreas of this Miscarriage seems a little too hard, when the Dissections of Women, as well by my self as others, many times instructed us, that the Sweetbread had no share many times in those hysteric Affections, as being altogether sound and perfect; but that the Fault lay in the Stones, that were very much swell'd, sometimes one, and sometimes both, half as bigg as a Hens Egg, sometimes ill coloured, and full of a virulent Liquor; and when as also it has been observed that in such a uterine Suffocation, that all the Symptomes have ceased upon Copulation, or the evacuation of Seed upon the Midwife's digitizing the part affected; and that by the use of moderate Coition the return of the Fit has been prevented, whereas the same Remedies us'd could no way avail to remove any Distemper of the pancreatic Juice either easily, suddainly, well or pleasantly.

Nothing to be concluded from Scents concerning the Motion of the Womb.

XXXI. *Neither can any thing be concluded from Scents in behalf of the said Opinion touching the Motion of the Womb.* For the Womb is not endued with Understanding, and consequently is no way affected with this or that good or bad Smell. For it has no Nose, nor any other Organ of Smelling, and therefore makes no Distinction between sweet or stinking Smells: neither covets or loves, or flies or hates either the one or the other; neither is sensible of any Smells as Smells; neither is affected by them, as they are Smells, but by their hot attenuating sharp discussing Quality.

Why stinking Smells are profitable.

XXXII. *Now that stinking Smells held to the Nostrils abate the Hysteric Fit, it is not because the Womb avoiding the Stench of stinking Smells descends, but because the Sense of smelling being offended by the ill Smells, the Brain contracts it self; and so not only sends fewer Spirits to the contracting Fibres of the Guts, and Nerves of the Mesentery,* the Diaphragma, *and the Muscles of the Jaws, but also stops the Entrance of the Vapors ascending from the Testicles and Womb into those Parts, and expells those that were entered before.* Which stinking Smells by virtue of their singular discussing Faculty dissipate as well in the Brain as in the Jaws, and so the Woman not only recovers herself, but upon the Relaxation of the Muscles of the Jaws is freed from her Fit.

Why sweet Smells are hurtful.

XXXIII. *On the other side sweet Smells increase the Fit, not because the Womb ascends to meet 'em, but because while their Fragrancie delights the Sense, to the end the woman may the longer enjoy that Pleasure, the Brain dilates it self, and so not only permits a greater Quantity of Spirits to flow to the Fibres aforesaid, and increase the Fit, but also admits more plentifully a greater Quantity of noxious Vapours ascending from the Womb, through the Pores every way dilated; whence the Effects of the Hysterical Passion, Anxietie, Raving, Drowsiness, and sometimes Epileptic Convulsions,* &c. But sweet things being rubb'd about the inside of the Privity, because they attenuate the thick and malignant Humours, they dilate the Pores, and powerfully discuss.

Trincavel, Eustachius Rudius, Herculas Saxonia, and *Mercurialis* give quite different Reasons for this thing, which *Daniel Sennertus* rejects and refutes: Who nevertheless not being well able to get out of this Labyrinth, and finding that the Womb is not sensible of Smells, nor is affected by 'em as they are Smells, flys to a certain hidden Quality affecting the Womb, imperceptible to our

our Senſes, which he believes to adhere in ſuch a manner to the Odours, as not to be ſeparated from 'em. But there is no ſuch need in this caſe of flying to any ſuch *occult Quality*, when the whole thing is plainly to be made out by *manifeſt Qualities* and Reaſons.

The Motion of the Womb in Women with Child.

XXXIV. *That the Womb in women with Child extends it ſelf every way, or ſlips out in falling down, makes nothing to prove its ſpontaneous Motion:* For in Women with Child the womb does not ſimply aſcend, but grows and ſwells upward and round about through all its parts: For as the Birth grows, ſo its Domicil inlarges it ſelf; and the bigger the Child grows, the bigger, thicker, and more fleſhy becomes the womb; ſo that near the time of Delivery it comes to be as thick as a Mans Thumb, or the breadth of two Fingers. Which is not cauſed by the ſole Influence of the Blood and Humours into the Poroſities of the womb, but by a real, firm, and fleſhy Increment. But there is a great Difference between the inlarging of the womb, and its ſpontaneous Motion. For the one requires a long time, the other is done in a Moment, and ſhould and ought to ceaſe: In the one the Subſtance of the womb is enlarged and thicken'd, in the other it ought to be extended and attenuated.

Its Motion in falling down.

XXXV. *In the falling down of the Womb, the Motion is not Spontaneous, for the Ligaments of it being looſened, and the Subſtance of it being affected with a cold and moiſt Diſtemper, it falls with its own weight, as all heavy things, and paralytic Members, having loſt their own ſpontaneous Motion, ſlip downwards.* In the ſame manner as a Man who falls from a high Steeple, does not move himſelf downward of his own accord, but is mov'd by his own weight againſt his will. From all which it is apparent, that the womb moves neither upward nor downward, nor tumbles about the lower Belly with a vagous Motion; but ſometimes by accident, ſometimes through Lankneſs ſlides to the ſides and lower parts.

A Child born, the Mother being dead.

XXXVI. *But againſt this our Concluſion another Difficulty oppoſes it ſelf: That is, if the Womb do not move it ſelf of its own accord, how comes it to paſs, that ſometimes after the Death of the Mother, the Birth in the womb is expell'd forth?* Thus *Bartholinus*, in the Treatiſe entitled *Phinx Theologico-Philoſophica*, relates the Story of an Infant, that with a loud cry was brought ſafe and ſound out of the womb of the dead Mother. And ſuch was the Birth of *Scipio* and *Manlius*, upon the Records of Hiſtory. *Eber* alſo produces an Example of a Child born after the Death of his Mother; and *Rolfinch* produces another out of the memorable Speeches of *Wolfang Silberus*. Three more are cited by *Philip Salmuth*; *Bartholin* alſo teſtifies the ſame thing to have happened at *Coppenhagen Hiſt. Anat. Cent.* 1. And I remember another Accident of the ſame Nature that was told me at *Montfurt*. *Harvey* alſo relates another of the ſame nature, *Exercit. de part.* *A Woman*, ſays he, *being dead in the Evening, was left alone in the Chamber, and the next Morning the Child was found between her Thighs, having made its own way.* Now as to the Difficulty, we ſay this, That the Mother being dead, the Infant may for ſome time ſurvive in the womb; ſo that being alive and ſtrong, and the Orifice of the womb open, and the Genitals being ſlippery and looſe by reaſon of the preceding Labours, and the Efflux of the ſerous Matter, it may ſo happen that the ſtrugling Birth may get forth by its own Endeavours, tho' aſſiſted by no Motion of the dead womb; and that ſuch Births have been frequently cut out of the *Abdomens* of the dead Mother is notoriouſly known. But the firſt Accident rarely happens tho' frequently it falls out, that women after moſt bitter Pangs of Childbearing, their Strength failing, fall into a profound Swoon, ſo that they are thought to be dead, and are ſometimes buried for ſuch, tho' it has been known that they have afterwards come to themſelves. VVhich often happens to thoſe that are troubled with the Hyſteric Paſſion, and for that reaſon being thought to be dead, are committed fairly to the Ground, as the Obſervations of many Phyſicians make manifeſt. *Johannes Matthæus*, Phyſician to the Marquis of *Baden*, produces a memorable Example of this. *Quæſt. medicar.* 4. *An Accident deſerving Compaſſion*, ſays he, *happened at* Madrid *in* Spain, *where a noble Matron, of the Family of* D. Francis de Laſſo, *after ſhe had lain in a Trance for three days after a hard Travel, her Relations believing her dead, was carried into the Vault appointed for the Burial of the Fa-*

mily. Some Months after the Vault being opened, for the Burial of some other Person, the Carcass was found in the same place where it was laid, holding a dead Infant in her right Arm.

Whence it appears that the Matron, when she was buried, was not really dead, but had been delivered of an unfortunate Infant, which she held in her Arms. Now in such a case I say it may easily happen, that the woman which was thought to be dead the day before, the next day was delivered, and in a short time after expired: For in extraordinary Cases of Necessity, Nature sometimes performs wonders. For which Reason, the woman is thought to have been delivered after her Death, who nevertheless was not dead at the time of her Delivery. So that from hence no spontaneous or proper Motion of the womb can be inferred. If after this, any one will be so obstinate as to believe that the womb is alive after the Decease of the woman, and is mov'd of it self by its own proper Power, of necessity with *Plato* he will split upon a most hard Rock of Absurdity, while he concludes that the womb is a Creature of it self, not living a Life common to the rest of the Body; and hence it will follow that one Creature is composed of two, or that one Creature is the perfecting part of the other.

CHAP. XXVI.

Of the Parts of the Womb.

The parts of the Womb enumerated.

I. *IN the womb particularly are to be considered the Bottom, the Neck, the Sheath, and the* Sinus Pudoris, *or Mouth of the Privity it self.*

The Bottom.

II. *The Bottom is the uppermost part of the womb, properly called the Matrix,* Uterus, *or Womb, outwardly smooth and equal, besmear'd with a slippery sort of Liquor, in women not separated by any winding Prominencies of Horns, nor so distinguished with Cells, as in most part of Beasts that bring forth living Conceptions,* It is harder and thicker in those that are not with Child, about the bigness of a Pigeons Egg, or somewhat bigger, which varies however according to the use of Copulation, Conception, and Age.

Its Cavity.

III. *It has one Hollowness, yet not exactly round, but somewhat stretched forth on both sides as it were like a Horn, toward the sides, in Persons deceased, hardly able to hold a Kidney Bean, but without doubt more loose in libidinous Coition; somewhat rugged with wrinkles for the better Retention of the Seed, and in women, before they come to be with Child, besmear'd with a viscous kind of Slime.* This is distinguished with a kind of large Seam into the right and left Part: In one of which Males, in the other Females are conceived, as *Hippocrates* and *Galen* have asserted. In the narrow Streights of this Cavity, the Vivific Spirit of Male Seed infused into the womans Egg, finishes out of it self that wonderful Structure of so many Parts, so that at length a noble Creature, shortly to ascend Heaven it self, breaks out of this small, close, and nasty Prison.

The Neck.

IV. *The Neck of the womb, which many confound with the Sheath, is the lower and narrower part of the womb, containing the innermost Orifice of the womb. Which Hole is oblong and transverse, or overthwart, like the Hole in the nut of the Yard; in Virgins narrow and smooth, but in such as have had Children, bigger, and furnish'd as it were with two Lips somewhat hard, or little pieces of Flesh somewhat Tumid, which Lips are hardly or never to be found in Virgins.* This Orifice is exactly shut after the Reception of the Seed, and as it were seal'd up with a slimy viscous yellowish Humour, that by the Report of *Galen*, it will not admit the point of a Probe, neither does it open before the time of Travel, unless by fervent and libidinous Coition, whence sometimes happens Superfœtation. But at the time of Delivery for the Expulsion of the Birth it dilates and spreads after a miraculous manner like a Rose; and then the foresaid Lips of the Orifice, as I have observ'd in women deceased when bigg with Child, equal in thickness half a Finger, very loose, slippery, and hollow like a Spunge.

Whether the Yard reach the Orifice of the Womb.

V. *Rarely the Yard of a Man in Copulation reaches so far as this Orifice,*

fice, which Riolanus *however asserts may happen sometimes. It may be,* says he, *that a longer Yard, when the Orifice is open, at the time when the Flowers flow, being thrust into that Orifice, may be there detain'd and squeez'd, as happens in the Limeing of Bitches; which that it has happen'd to some, I am credibly inform'd.* Thus when I was a Student at *Leyden*, I remember, there was a young Bridegroom in that Town, that being over-wanton with his Bride, had so hamper'd himself in her Privities, that he could not draw his Yard forth, till *Delmehorst* the Physician unty'd the Knot, by casting cold Water upon the part.

Certainly 'tis a wonder how such a narrow Orifice of the Womb can be so much dilated, as to receive the Nut of the Yard; which is the reason some think it impossible to be done, and look upon as Fables, whatever has been said touching this matter. But this is to be said, that in a very fervent Lust, all those obscene parts grow very hot, and are relax'd to that degree, as to receive the Yard with ease: as appears by the Uterine *Sheath*, which not being heated by libidinous Ardour, is so strait that it will not admit the Yard without difficulty, but in the Act of Venery, thro' the more copious affluency of Blood and Spirits, stiffens, grows warm, and swells, and then becomes so loose, and soft, that it easily receives the Yard. Therefore it would be no wonder, if in some, through extream Lust, this Orifice of the Womb be so relax'd, as to admit the Yard, especially if the *Sheath* be short, and the Yard so long as to reach and enter the *Sybilline Chink*. Nor is this more to be admired at, than that the Orifice it self in time of Labour, should of its own accord be so relax'd for a large Infant to pass thorough, or for the Chirurgeon to thrust in his Hand and part of his Arm to draw forth the Birth, when necessity requires.

The sheath. VI. *Continuous to the bottom and neck of the Womb, is the* Greater Neck *or* Gate of the Womb, *commonly call'd the* Vagina *or* Sheath; *because it receives the Yard like a Sheath.*

This is a smooth and soft Chanel, every way enclosing and grasping the Yard in Copulation, furnish'd with fleshie Fibres running out in length, by which it is fasten'd to the other adjacent parts; and within-side, full of orbicular furrows or wrinkles, more in the upper part than the lower, and more toward the Privity than toward the Womb, and unequal, to procure the greater pleasure of Titillation from rubbing to and fro; of a membranous, and as it were nervous, and somewhat spungy Substance, which swells in the heat of Lust, the better to embrace the Yard; about the length of the middle finger, and as broad as the *Intestinum Rectum*. Nevertheless, the length, breadth, and loosness of it vary according to the Age of the Person, her Use of Venery, and her natural Constitution: and sometimes this length and breadth of the Sheath varies according to the length or bigness of the Yard in Men. Whence *Spigelius* thus writes, *Annat. l. 8. c. 22. The Sheath every where embraces the Yard, and frames it self to all its Dimensions, so that it meets a short one, gives way to a long one, dilates to a thick one, and straitens to a small one: for Nature so manages all these differences, in respect to the magnitude of the Yard, that it is needless to endeavour to fit the Tools, or regard their proportion, for that the great Fabricator has every where done it so admirably.*

In like manner in Virgins, and Women not so prone to Venery, as in those that never had Children or Labour under an immoderate Flux of their Flowers, or their *Whites*, the wrinkles are much deeper and thicker, and more numerous; but in Women that have had many Children, as also in Harlots often lain withal, they are neither so deep nor so numerous, if not many times worn smooth.

VII. *This Sheath in Infants is remarkably capacious, tho' the Orifice be very narrow: as it is also in grown Virgins never lain with, which in the first act of Coition is somewhat dilated, with the rupture of the* Hymen; *but in Women that use but moderate Copulation, it remains still in such a condition, that the Yard passes through a kind of looser sort of* Sphincter Muscle *toward the innermost* Sheath. *The largeness.*

VIII. *It is furnish'd with Vessels of all sorts. It has two sorts of Arteries: some from the* Hæmorrhoidal Arteries, *creeping through the lower part of it; others from the* Hypogastrics *descending along the sides of it, and then dispers'd through the whole Sheath, and in the upper part for the most* *The Vessels of the Sheath. The Arteries.*

most part adhering to the Arteries of the Womb.

The Veins. IX. *Several Veins it ſends forth from its lower part to the* Hæmorrhoidals; *the reſt, far more in number, and every way diſpers'd into its Subſtance, to the* Hypogaſtrics, *into which they empty the Blood which is contain'd in 'em, from thence to be conveigh'd farther to the greater Veſſels, and ſo to the heart.* And out of theſe Blood-bearing Veſſels it is that that ſame little Net is form'd diſcover'd by *Regner de Graef.*

Its Nerves. X. *It receives its Nerves from thoſe that run out from the* Os Sacrum.

Lymphatic Veſſels. XI. Regner de Graef *alſo writes, That he has here obſerv'd certain very ſmall* Lymphatic Veſſels, *which in their aſcent penetrating through the External Subſtance of the Womb, meet together by degrees, and increaſe like ſmall Rivulets, till they came to the great Receptacle of the* Chylus, *and then open themſelves into it.*

Beſides theſe Veſſels, there run out into the forepart of the Sheath thoſe Chanels ſticking to the Subſtance of the Urinary Paſſage, of which hereafter.

The Neck of the Bladder. XII. *To the end of it, that is, at its firſt entrance under the Nymphs, both before and atop adheres the neck of the Piſs-bladder, wrapt about with the* Sphincter, *having there an* Exit; *but in the hinder part it is firmly faſten'd with the binding Muſcle of the* Inteſtinum Rectum.

Regner de Graef has well obſerv'd, that the Sphincter of the Bladder embraces the lower part of the Sheath with a conveighance of Fibres, three fingers broad; to the end that in Coition it might be able gently to cloſe it ſelf about the Yard; which Conſtriction he believes to be mainly helped forward by other Bodies, found out by himſelf, of which he thus writes: *To this Conſtriction thoſe Bodies contribute after a wonderful manner, which, the fleſhie Expanſions ariſing from the* Sphincter, *being remov'd, appear on both ſides near the Lips of the Privity in the lower part of the Sheath. For they aſcend on both ſides to the membranous Subſtance, which is faſten'd to the neighbouring Parts, and to the* Clitoris; *and there terminate and vaniſh: ſo that the Bodies of the right and left ſide have no Communion one with another; as may be ſeen if either be fill'd with Wine: for the Body of the right ſide being blown up, the left never ſwells; neither if the left be fill'd, is the right diſtended, or the* Clitoris *erected. The outward Subſtance of theſe conſiſts of a very thin Membrane; the inner, which for the moſt part, like the inner Subſtance of the* Clitoris, *by reaſon of the quantity of coagulated Blood, is of a blackiſh colour, is woven out of ſeveral little Fibres and Veſſels, united and twiſted one among another, which for its reſemblance to a Net is call'd* Plexus Retiformis, *the Net reſembling Fold.*

The Net-reſembling Fold. *This* Plexus Retiformis, *or Net-reſembling Fold is in my opinion there plac'd, that the Orifice of the Sheath may be ſo much the cloſer ſtraiten'd, and the Virile Member ſtraitly embrac'd: For being diſtended with that plenty of Blood, when by reaſon of the fleſhie Fibres of the Sphincter Muſcle compreſſing it, it cannot ſwell outward, it muſt ſwell inwardly, and ſtraiten the Orifice of the Sheath. Now the diſtenſion of theſe parts will appear to the Eye, if the bloody Veſſels running through along the back of the* Clitoris *be fill'd with a little breath, for then the whole Privity ſwells together with that ſame Fold.*

Now becauſe this Chanel of the *Sheath* is narrower in Virgins, many, with *Soranus*, believe that the pain which Virgins feel in the firſt act of Coition, and the Blood which breaks forth, is caus'd by the Dilatation of this Chanel by the Yard, and the Rupture of the little Veins and Arteries paſſing thorough it; which others rather aſcribe to the Rupture of the *Vagina*, or Sheath.

The uſe of the Vagina. XIII. *The Uſe of the* Vagina, *or* Sheath, *is to receive the Yard, to embrace and gently gird it ſelf about it. To this end it grows warm in the heat of Luſt, by reaſon of the Afflux of Blood and Spirits to it. So that it is ſomewhat in a manner erected, and dilates it ſelf, the more conveniently to admit the Yard.* Whereas, when that heat is over by reaſon of its laxity and ſoftneſs, it prevents the entrance of the External Air; nor if the woman be in a Bathe, will it admit water to enter the womb: but when a woman has her monthly Purgations, or is troubled with the *Whites*, as alſo in time of Labour it does not dilate it ſelf, but the cloſing ſides of it, being preſs'd down by the weight of the Birth, and Humours part one from another, and ſo are compelled to give way to neceſſary Evacuation.

XIV.

The reason of that use.

XIV. *Now that the* Vagina *must and ought to be dilated in the same manner as has been said, and without that dilatation would hardly admit the Virile Member, is plain from those women that take no pleasure either in a violent or unvoluntary Coition; but rather on the other side, complain of great pains, by reason of the violent forcing of the sides of the* Vagina *one from another through the force of the entring Yard:* and is yet more apparent from the pain that some Virgins feel that come to be lain withal before they have any understanding, and consequently no understanding to warm them to the Action. In reference to which *Plazzonus* relates a very sad Story. *Lately,* says he, *it happened, that a young man being to lye with his Bride the first night, what with his eager haste, and the robustious intrusion of his Member, he not only broke the neck of her Bladder, but the* Intestinum Rectum, *withal. For which I could give no other Reason, but that her Privity, not us'd to erection, flagg'd in its first performance of admitting and receiving her Husband's first Addresses.* Thus, I remember, that I knew a young Bride in upper *Batavia*, to whom, by the violent immission of the Yard in the first Act of Coition, and suddain dilatation of the *Vagina*, there happen'd such a prodigious Flux of Blood, that in three hours she lost her Life, together with her Virginity. And the like unfortunate Accident some years ago befell the Daughter of a certain Citizen of *Utrecht*, who was so wounded the first night, that before morning, the Flux of Blood not being to be stopp'd, she expir'd.

A thin nervous Membrane call'd Hymen.

XV. *Below the insertion of the Neck of the Bladder, in Virgins, there appears a thin nervous Membrane, continuous to the Neck of the Substance, and sticking orbicularly to its sides, interwoven with fleshie Fibres, and furnish'd with many little Arteries and Veins, and bor'd through the middle for the Efflux of the monthly Purgations, that in grown Virgins it will hardly admit the top of the little finger, which the Ancients call'd* Hymen, *others the* Claustrum of Virginity, *others the* Girdle of Chastity. Which being safe and whole, is a certain sign of Virginity, and being that which must of necessity be broken by the first irruption of the Virile Member, and sends forth a small quantity of Blood, which they call *Flos Virginitatis*, the Flower of Virginity: but being broken, it vanishes, and never more grows again.

Hymen *sometimes not perforated, but like a Sive.*

XVI. *This Membrane, to the great loss of health, has been observ'd by* Cabrolius, Vesalius, *and others, not thin and perforated, as is before mention'd; but somewhat thick, firm, and contiguous, and sometimes bor'd through like a Sive.* So in the Year 1666. in the Month of *March*, we dissected a young Woman of three and twenty years of Age, wherein we found that same Membrane continuous, not perforated at all, and so firm, that the stoutest Efforts of a lusty young Bride grown could never have pierc'd it.

Now when it is so extreamly strong, then in grown Women, there is a stoppage of the Flowers, and other Evacuations that way, which is the Death of many Virgins, unless cur'd by cutting the Membrane; of which sort of Cure there are several Examples to be found in *Benivenius*, *Wierus*, *Aquapendens*, *Hildan*, and several others. Here some have been of Opinion, That the said Membrane, hard and unperforated, is a Substance quite different from the *Hymen*, growing there contrary to the order of Nature: whereas in truth it is the *Hymen* it self, preternaturally harden'd to that Solidity, neither will any man ever find any other.

Whether Hymen *or no?*

XVII. *Many question the truth of this Membrane, others deny that ever it was found, and account as Fables whatever has been said concerning the* Hymen. *Others with* Oribasius, Soranus, Fernelius, *and* Laurentius, *conceited Virginity to be nothing else than the wrinkled straitness of the Female* Vagina, *overspread with Veins, the dilaceration of which in the first Act of Coition, and the rupture of the little Veins, by means of the same violence, causes a light Flux of Blood.* But *Vesalius* and *Fallopius*, most expert Anatomists, have found that Membrane in all Virgins, as have also *Columbus*, *Plater*, *Picolomni*, *Jubart*, *Spigelius*, *Wierus*, *Regner de Graef*, and several other eminent Persons, to whose Ocular Testimony we must give credit. And not only they, but I my self, at the Dissection of a Virgin about two and twenty years of Age, in *Decemb.* 1671. shew'd that Membrane to several Students in Physic,

Phyſic, reſembling a membranous Ring orbicularly plac'd in the *Vagina* of the Womb, with a hole in the middle as big as the top of the little finger, not exactly round, but ſomewhat oblong in the upper part. And *Swammerdam* writes that he took out ſuch a *Hymen* out of the Body of a Virgin which reſembled the flat perforated ſmall Ring, that is put under the Glaſs in Proſpective Glaſſes, and cloſes all the reſt of the opening of the Tube; as this Membrane ſhuts up the Tube of the Sheath, and the outermoſt Neck of the Womb.

Whether the want of the Hymen *be a ſign of Virginity loſt.*

XVIII. *It is queſtion'd by ſome, Whether upon the want of that Membrane it may be well and truly ſaid, that ſuch a Maid, where ſuch a defect is found, has been deflowr'd by another Man?* *Riolanus* well obſerves, That the defect of this Membrane is not always a ſign of deflowr'd Virginity; becauſe, moſt certainly it is not to be found in all Virgins: For many times laſcivious and wanton Girls break that Membrane unknowingly, in their imitation of Coition, with their Finger, or any other Inſtrument. Beſides, that in ſome it is ſo thin and ſo ſoft, that eaſily giving way in the firſt Act, it neither makes any reſiſtance againſt the Bridegroom, nor does it bleed at all.

Beſides that, it may be corroded away by the paſſing thorough of ſharp Humours, or elſe broken by a fall or a blow, or by the Midwives finger, as in the *Hyſteric Paſſion.*

Now that it may be ſo relax'd and ſoften'd by the Afflux of the Flowers, and other Humours, as to give free paſſage to the Yard without pain or trouble, and will dilate rather than be dilacerated, and conſequently never emit any blood in the firſt Act, *Pinæus* makes out by two Examples, which he cites *Lib.* 1. *de Not. Virgin. c.* 6. And thus that Text in *Deuteronomy* is certainly to be expounded: that is to ſay, if the red piece of Linnen were ſhew'd, then there was no doubt to be made of the Virginity of the Maid: but notwithſtanding, if it could not be produc'd, yet however it was not to be concluded that the Maid had loſt her Virginity; but before too ſevere a Sentence be pronounc'd, inquiry was to be made, why that Efflux of Blood fail'd in the firſt Coition; whether ſhe had been broken up before, or whether it might not be an effect of any other of thoſe Natural Cauſes by me recited.

But before I leave this place, I cannot but add the elegant Verſes of *Catullus*, which he writes *De flore Virginitatis*, to wit, concerning that Blood which commonly breaks forth upon the Rupture of the Membrane *Hymen*, in the firſt Coition.

Ut flos in ſeptis ſecretis naſcitur hortis,
Ignotus pecori, nullo contuſus aratro:
Quem mulcent auræ, firmat Sol, educat imber,
Multi illum pueri, multæ optavere puellæ.
Idem cum tenui carptus defloruit ungue.
Nulli illum pueri, nullæ optavere puellæ.
Sic Virgo, dum intacta manet, tum chara ſuis: ſed
Cum Caſtum amiſit, polluto corpore, florem,
Nec pueris jucunda manet, nec chara puellis.

Which I render into Engliſh thus:

As Flowers in encloſed Gardens grow,
Not cropt by Beaſts, nor bruiſed by the Plough:
Whoſe brighter Glories, Solar Beams inveſt,
And Fragrancies by gentle Rain increaſt;
Invites all Human kind, to love, and take:
That ſame, when cropt, its Beauty does forſake.
Thoſe that before ador'd it, now deſpiſe
And ſlight the once dear Object of their Eyes.

Such is a Virgin, while ſhe ſo remains,
While her unſpotted Honour ſhe retains.
But when that's blaſted, ſhe's no more the ſame;
Nor to her Virgin Vertues can lay claim.
But like a wither'd Flower is undon,
And by all Human kind is piſt upon.
Thoſe that before ador'd her, now deſpiſe,
And ſlight the once dear Object of their Eyes.

The Myrtle form'd little pieces of Fleſh.

XIX. *Upon this Membrane reſt four* Carunculæ, *or little pieces of fleſh, call'd the* Myrtiformes, *Myrtle ſhap'd, becauſe they reſemble the Berries of Myrtle; ſo plac'd, that every one poſſeſſes an Angle, and anſwer one another in a ſquare. One of 'em, bigger than the reſt, and forked, belongs to the hole of the Urinary paſſage, which it ſhuts when the Urine is voided. The ſecond ſtands behind oppoſite to this: the other two are collateral.*

Theſe *Caruncula*, or little pieces of Fleſh, in ſome are ſhorter, in ſome longer, thicker or ſlenderer. Which are ſaid to meet together, with certain little Mem-

Membranes, in the outermoſt part, leaving a hole in the middle, whoſe cloſing together ſome take for the *Hymen* Membrane.

Their uſe. XX. *They are ſaid to be appointed for Pleaſure and Titillation while their being ſwell'd and puff't up, ſtraitens and bewitchingly ſqueezes the Yard.*

Theſe Caruncles are ſo deſcrib'd by ſeveral Anatomiſts, as if they were to be found in all Women; when there is only one to be found in Virgins, but all four are to be found in Perſons deflowr'd. But as for the ſecond Membrane, made by the cloſing of theſe Caruncles, over and above the *Hymen*, I ſhall believe it when any Body ſhews it me.

Riolanus, the moſt accurate Anatomiſt of his time, not without reaſon ſuſpects thoſe three leſſer Tunicles, not to be real little pieces of Fleſh, but little ſwellings or warts proceeding from the Rupture of the *Hymen*, and the wrinkling the *Vagina* of the Privity: and reports that he has found that wrinkled roughneſs altogether levell'd for the paſſages of the Child, in Women that have been deliver'd ſix or ſeven days, which, were they true little pieces of Fleſh, would preſerve their ſhape and ſubſtance in the diſtenſion of the Neck of the Womb; or at leaſt ſome ſign of 'em would remain, whereas there is nothing to be ſeen of 'em, but when the Privity is again reduc'd to its accuſtom'd ſtraitneſs. He adds, that theſe three little Bodies, were they real little pieces of Fleſh, would be a great impediment to Women in Labour, for that their roughneſs and inequality would hinder the Egreſs of the Infant. He proves the truth of this Aſſertion by Ocular view and experience, affirming that in the Diſſections of Virgins, after he had ſeparated the *Nymphs*, he found a fleſhie or circular Membrane, perforated with a little hole in the middle, big enough for a Pea to go through, which Membrane being torn, he ſaw no other *Caruncles*, but one always apply'd to the Orifice of the Bladder; but the other three he never found; and conjectures the foremention'd Caruncle to be the Extremity of the Sphincter of the Bladder.

The Womans Privities. XXI. *Therefore in regard they only are to be found in married People, the* Hymen *being broken, and not in Virgins, he ſtrongly infers that thoſe three leſſer Caruncles, are nothing elſe than the Angular parts of this broken Membrane, pucker'd up into a heap by the wrinkling of the fleſhie* Vagina. And thus has this moſt excellent Perſon, by his great Experience, unfolded thoſe doubts, which have hitherto occaſion'd ſo many Diſputes among Anatomiſts concerning the *Hymen*, and the Caruncles.

The outward part of the Womb, or Vulva. XXII. *The outward part of the Womb, call'd in Greek* αἰδοῖον γυναικεῖον, *in Latin* Pudendum Muliebre, Membrum Genitale, *and* Vulva, *as it were* Valva, *or a Folding Door, being clos'd with two* Valva's *and* Nymphs *like Folding Doors; alſo* Orificium Exterius, *the Outward Orifice, and* Cunnus, *from* κυεῖν, *to conceive; in Engliſh, the Womans Privities or Quaint, is ſeated in the foremoſt Region of the Share-bone.*

The bigneſs. XXIII. *In Virgins it is much leſs and thicker than in thoſe that have had Children, and in thoſe that are arriv'd at years of Maturity, is cover'd with Hair above and on each ſide, while Nature endeavours to hide the obſcene Part.*

Spigelius believes there may be a certain Judgment made of the bigneſs of the Privity by ſeveral External Marks. *For*, ſays he *Anat. l.* 1. *c.* 10. *the proportion of the Womans Privity is to be taken for the moſt part from her mouth: for they that have wide mouths and large eyes, have generally large Privities; and I have obſerv'd by manifold Experience, that all thick and fat Women that have large Breaſts and Bellies, have alſo large Privities. On the other ſide, they that have little flat Breaſts, a narrow Mouth, a peeked Chin, and thin Lips, have likewiſe ſtraiter and narrower Privities.*

The Lips. XXIV. *The outward Lips appear firſt to the Eye, which toward the Hair are ſomewhat thicker and higher rais'd, and there cloſing, and more protuberant, compoſe the* Mount of Venus, *as being ſeated at the Threſhold of* Venus's *Temple, which they that offer to* Venus *muſt be forc'd to enter.*

The Mount of Venus.

Of what they are compoſed. XXV. *They are compos'd of a peculiar fleſhie Subſtance, and in ſome meaſure ſpungy, which in heat of Luſt ſwells, and at the time of Delivery becomes very ſoft and tumid.* It was my hap to ſee in two Women newly deliver'd of the Birth, when the *Secundine* follow'd, their Lips ſo looſen'd, and a great part of the *Uterine Liver* thruſt it ſelf into them; whereupon the Mid-

wife

wife, not understanding what such an unusual Accident meant, the *Physician* and *Surgeon* were call'd, who observing the Lips to be stuff't with the said Liver, and for that reason unusually swell'd, and withal, as it were a piece of black Flesh budding forth, thought the Privity to be torn in the Labour, and the part to be already gangren'd. Thereupon believing the Woman to be in very great danger, I was sought for. But when I came to view the Privity, I presently observ'd that black Flesh to be a part of the *Uterine Liver*, which had thrust it self into the Lips, being inwardly dilated, which being drawn out with a pair of Nippers, both Women were freed from the imaginary fear of any *Gangrene*.

A slight Motion in the Lips.

XXVI. Riolanus *attributes to these Lips a slight Motion of Dilatation and Constriction, which he affirms to have been often experienced in lustful Women, stimulated more than usually with the stings of Venery.* And farther, he says that the Constriction is made by the Muscle of the *Clitoris*, extended under the Lips of the Privity; and the Dilatation by the other Muscle, which is under the Ligament. *Lindan* will rather have these two Muscles extended from the *Sphincter* of the *Podex* through the Groyns, and being thin and broad, to be inserted into the Internal Front of the Lips, and upon the Evacuation of Urine, that the Lips are by them divided, and after pissing clos'd again.

The Nymphs.

XXVII. *Near to the Lips stand two fleshie soft Productions, call'd* Nymphæ, *Nymphs, or Wings; in Greek* πτερύγια. *These arise at the joyning together or commissure of the Share-bones, where they are joyn'd with an acute Angle, and constitute the wrinkl'd fleshie Production, that clothes the* Clitoris, *like the* Præputium; *and descend about half way, the Lips every where touching one another for the most part, and end in their lower part with an obtuse Angle, as being almost of a Triangular Figure; resembling somewhat in colour that part of the Cock's Comb, that hangs under his Throat.*

Their Substance.

XXVIII. *They are of a ruddy Substance, partly fleshie, partly membranous, soft, puffie, clad with a thin Tunicle, different in thickness and bigness, according to the diversity of Age; being generally about a fingers joynt in length, and thin, nor very broad in Virgins till five and twenty years of Age.* In those of riper years, especially such as have lain with Man, and born Children, they become thicker and broader; but never descend above half way the Lips. These very seldom grow luxuriant in our Regions; but among the *Egyptians*, by the report of *Galen*, frequently grow out to such a length, that through the shame and trouble which they cause, they are forc'd to make use of Incision.

Their Vessels.

XXIX. *These Nymphs, together with the Lips, besides the little Nerves from the sixth Pair, have very many remarkable Vessels dispers'd through the outer and inner Substance.* For they receive *Arteries* from the Branch of the Inner *Iliac* (call'd the *Privity-Branch*) conveighing plenty of Blood in the heat of Lust, which causes 'em to swell. They also send *Veins* to the Privity-Vein, into which, when the heat of Lust is over, they again empty their collected Blood. Which Veins in Women with Child sometimes swell to that degree, that they resemble those Swellings, call'd *Varices*.

Their Use.

XXX. *The use of the Lips and Nymphs is to close and straiten the Entrance of the Privity; and to preserve the Womb from the Injuries of the External Air.*

An Observation.

Concerning the Lips and Nymphs, I observ'd an unusual Accident at *Nimmeghen*, in the year 1640. A certain Woman, a Seaman's Wife, together with her Daughter about four and twenty years of Age, and after she had shed a great many Tears, out of her modesty, made her complaint, That her Daughter was uncapable of Man, and asked me if I could remove the Obstacle. She told me that her Daughter's Privity, presently after she was born, was well shap'd, but being after that put to Nurse, and carelesly look't after, her Buttocks, Privities, and Parts adjoyning, would be miserably excoriated by the Acrimony of the Urine and Excrement, by which means her Privity clos'd together, leaving only a little hole for the passage of her Urine and Flowers. When I view'd the Part, I found the Lips and the Nymphs were exactly grown together, as if there never had been any passage before. Thereupon thrusting an Iron Probe

Probe in at the hole, I found that the cloſure was only ſuperficial, but that within there was nothing grown preternaturally together. Sending therefore for *Henry Chatborn* the Surgeon, I order'd him to make an Inciſion upon the Iron Probe thruſt into the hole, and then to cure up the Wound; which was done in a few days: inſomuch that the Maid in three Months after being married to a Husband, there were no farther Complaints of the narrowneſs of the Privity, and the next year ſhe was deliver'd of a luſty Infant.

The Cleft of the Privity.

XXXI. *Between the cloſing* Lips, *appears the* Rift, *or* Clift *of the Privity: and the Wings and Lips being ſeparated, the Cleft appears ſtill deeper, which the Moderns call the* Dike, *or the* Great Cleft, *to diſtinguiſh it from the firſt mention'd.* This runs along from the Share bones to the folding of the Buttocks and the *Podex*, diſtant from it about a thumbs breadth, and the more backward it bends, the broader and deeper it is; and forms as it were a hollow Valley, or a hollow Dike, repreſenting the ſhape of a ſmall Ship, and terminates in the Border of the Orifice of the Uterine *Vagina*. This ſame ſpace, which is generally call'd *Interfœmineum*, and *Interforamineum*, we have obſerv'd in hard Labours moſt terribly dilacerated, and by that means the Cleft or lower part of the *Vagina* has gap'd to the very *Podex*, difficultly cur'd in ſome, and in others, never. Into the middle of the Dike enters the Orifice of the neck of the Womb, or *Vagina*, or Chanel that receives the Yard. To which, at the upper part adjoyns the urinary Paſſage, through which the Urine flows out of the Bladder. Which Orifice of the neck of the Womb or *Vagina*, is ſometimes ſo ſtraitened by Chaps and Fiſſures, or the Scar of ſome Exulceration, that never afterwards they are able to lie with their Husbands. Sometimes alſo after violent Labour being dilacerated, it cloſes up altogether, and leaves the woman unperforated, or elſe with a very ſmall Hole. Of which *Bauhinus* produces ſeveral Examples, *Anat. l.* 1. *c.* 39. And *Cabrolius* in his *Obſerv.* 23. relates the Stoppage of this Orifice in a Chirurgeon, and how it was open'd again by a Chirurgeon.

The Clitoris.

XXXII. *Now a little higher in the middle part between the Wings, there juts out a ſmall Particle called in Greek* Κλειτορὶς, Clitoris, ἀπὸ τῦ Κλειτοριζειν, *or* Κλειτοριάζειν, *to wantonize and laſciviouſly to handle a Womans Privities. Avicen* calls it *Albathara*, or a *Twigg*. By *Albucaſis* it is called *Tentigo*. For it anſwers the Virile Twig, or Rod, in Shape, Situation, Subſtance, Repletion with Spirits and Erection, differing only in bigneſs and length.

Its Subſtance.

XXXIII. *It is a ſmall round Body conſiſting of two nervous Portions black within and ſpungy, riſing on both ſides from the Excreſcence of the Huckle-Bone, as from two Thighs meeting together at the Conjunction of the Share-Bone.* Which Beginnings, or Thighs *Riolanus* calls the white Ligaments.

To theſe Thighs the round Ligaments of the Womb reach with their Ends, which formerly being led aſtray by *Spigelius*, I took to be the Veſſels conveighing the Seed.

The Tentigo.

XXXIV. *The Extremity or Nut of the* Clitoris, *is called* Tentigo, *having a Subſtance like that of the Nut of a Mans Yard, which is covered with a certain thin Skin, like the* Præputium, *proceeding from the Conjunction of the Wings.* At the top there appears a long hole like the hole of a Mans Yard, but not pervious or bor'd quite through.

Its Muſcles.

XXXV. *The* Clitoris *like a Mans Yard, has four Muſcles ſerving for the ſame Office, two round above ariſing from the Hip-Bone; and two below, broad and fleſhy, proceeding from the* Sphincter *of the* Podex, *which creeping backward through the Lips of the Privity, are faſten'd to the* Clitoris. The uſe of which *Regner de Graef* believes to be not ſo much for the Erection of the *Clitoris* as for the Contraction of the Orifice of the *Uterine Vagina*. *Pinæus* acknowledges only three Muſcles.

Its Arteries and other Veſſels.

XXXVI. *It receives Arteries from the Privitie-Arteries, which in the heat of Concupiſcence and Coition, bring ſpirituous Blood in great Quantity, which afterwards the privity Veins carry back to the greater Veins.* Beſides theſe *Regner de Graef* has obſerv'd ſuch like Veſſels to reach from the *Hæmmorrhoidals* to the *Clitoris*. Now theſe Veſſels are communicated to the *Clitoris*, where the two meeting they conſtitute its third body, whoſe Subſtance

ſtance they enter only with ſmall little Branches, and together with the Animal Spirit flowing through the Nerves, cauſe it to ſwell in the height of Concupiſcence. The ſame *Regner de Graef* obſerves that the Veins of the right and left ſide for the moſt part are clos'd together by *Anaſtomoſes*, before they deſcend to the ſides of the *Clitoris*, and run forward to the Net reſembling Fold and other parts of the *Pudendum*; but that in the Arteries of each ſide *Anaſtomoſes* are rarely to be found.

Its Nerves. XXXVII. *Beſides the* Vaſa Sanguifera, *there is alſo a ſmall Nerve, proceeding from the ſixth Pair, which endues it with an exquiſite Senſe of Feeling, and occaſions that pleaſing Titillation in the act of Venerie, ſo that the chiefeſt Seat of Womens Pleaſure in Coition is in this part.* VVhence by *Bauhinus* it's call'd the *Sting* of *Venus*; by *Columbus* and others the *Sweetneſs of Love*. Nevertheleſs the moſt charming and voluptuous Titillation lies in the rubbing of the *Tentigo* or Nut.

A bonie Clitoris. XXXVIII. *Very rarely, or hardly ever do we hear of what* Bauhinus *has obſerved concerning a* Clitoris, *that it became bony in a Venetian Curteſan*; which by reaſon of its extream Hardneſs did ſo offend and hurt her Lovers in Coition, that many times by reaſon of Inflammations they were forced to fly to the Surgeon for Help.

The Exit of the Urinary Paſſage. XXXIX. *A little below the* Clitoris, *above the Mouth of the* Uterine Vagina, *between the* Nymphæ, *the exit of the Urinary Paſſage is Conſpicuous*; which being ſomewhat prominent, and compoſing the ſuperior Caruncle, is the Extremity of the *Sphincter* of the Bladder, by means of which *Sphincter*, after the Urine evacuated, the Orifice of the bladder is again drawn together and cloſed up.

The neck of the Bladder. XL. *The neck of the Bladder in grown Women is the breadth of two Fingers in length, wrapt about by the* Sphincter *Muſcle, which enfolds the whole length of it.*

The Proſtates of Women. XLI. *But the neck it ſelf conſiſts within of a thin Membrane, which the Membranous Subſtance girdles round, being as it were glandulous, whitiſh, and about the length of one Finger thick, and full of Pores, eſpecially near the Exit of the Urinary Paſſage, through which ſeveral larger Chanels running, terminate near the Exit of the Urinary Paſſage, and in the fore-part of the* Uterine Vagina. Some there are who think that the vitious, ſerous, and flegmatick Humours that dayly flow from many women, are evacuated through theſe Chanels; but *Regner de Graef*, a moſt accurate Anatomiſt, not without good Reaſon aſcribing to that thicker Subſtance encompaſſing the *Urethra* the uſe of the *Proſtates*, believes that there is bred therein a kind of ſeminal and ſomewhat ſlimy Juice, endued with a certain Acrimony and Saltneſs, which cauſes Deſire, and makes women Salacious, and breaking forth through thoſe little Chanels and Pores, renders the Privities delightfully Slippery in Coition. The ſame *Regner de Graef*, who believes that viſcous Matter coming from the Yard in the *Gonorrhea*, to be ſeldom evacuated from the Stones or ſeminal Veſſels, but moſt frequently from the Stones, believes alſo that in women troubled with the *Gonorrhea*, the ſame matter is evacuated out of theſe Parts alone, which he calls *Proſtates*, and confirms it by this Example. *Now that the* Gonorrhea, ſays he, *flows from the Glandulous Body, and through the little Sewers in and about the Urinary Paſſage, the Diſſection of a certain Woman infected with this Diſeaſe made manifeſt, for her Womb and* Vagina *being untouch'd, we found only the Glandulous Body or* Proſtates *to be faulty.*

The Orifice may be dilated. XLII. *But the ſaid Orifice or neck of the Bladder, by reaſon of the ſoftneſs of the Subſtance, may eaſily be dilated, for Stones of an indifferent bigneſs to be expell'd and brought away by the great quantity of Urine ruſhing out at the ſame time with little or no Trouble*; or ſo that the ſame Stones, Dilatation being firſt made by the help of Inſtruments, may be drawn out of the bladder without any Inciſion, as we find it many times ſucceſsfully done by your Lithotomiſts.

The Bigneſs. XLIII. *The* Clitoris *is uſually but ſmall, and lies hid under the* Nymphs *in the middle fatter part of the Privities, or in the top of the larger Cleft: Afterwards in grown People it grows ſomewhat prominent, and when it ſwells it ſtirs up Concupiſcence.*

Riolanus well obſerves that in living People, where all things ſwell with Heat

Heat and Spirit, this Part is manifeſtly to be ſeen, eſpecially in the more Laſcivious, that have more voluptuouſly addicted themſelves to Copulation; but that in dead women it hardly appears, by reaſon of the ſmallneſs of its bulk, that falls upon the Diſſipation of the Spirits. And yet we publicly ſhew'd it at the Theater in the diſſected body of one not above twenty four Years of Age.

Its Irregularities.

XLIV. *Sometimes it happens, that contrary to the common Courſe of Nature, this part grows out much more in length like the Yard of a Man, ſo that Women have made an ill uſe of it, by copulating with others of their own Sex, hence called Confricatrices, but anciently* Tribades. Thus *Platerus* aſſerts that he ſaw a womans *Clitoris*, equalling in length and thickneſs the Neck of a Gooſe. *Riolanus* and *Schenkius* have obſerved it as long as a Mans little Finger. *Regner de Graef* ſaw a Girl new Born, whoſe *Clitoris* had ſuch a Reſemblance to a Mans Yard, that the Midwife and the reſt of the women there preſent, took it for a Boy; and gave it a Mans Name in Baptiſm. *Plempius* writes of one *Helena*, that lay with ſeveral Women and vitiated ſeveral Virgins with that Part. I my ſelf in a certain woman at *Montfort* ſaw a *Clitoris* as long and thick as the ordinary Yard of a Man, which happened to grow to that extent, after ſhe had lain in three or four times.

Hermaphrodites.

XLV. *This is that part which in* Hermaphrodites *thus prodigiouſly encreaſing forms the Virile Member, which appears from hence, that in the ſlit of the Nut there is no conſpicuous Perforation to be ſeen; tho' the Stones ſeem to joyn to it at the ſides without.* Such an *Hermaphrodite* I remember I once ſaw in *France* near *Anjou* about 28 Years of Age; who was bearded about the Mouth like a Man, yet went in womens Apparel, and for a ſmall matter turn'd up her Coats to any one that had a mind to ſatisfy Curioſity. In this Party, the *Clitoris* at the upper end of the Privity, was grown out of the Privity about half a Fingers length, and as thick as a Mans Yard, with a Nut, Bridle, and Foreskin, as in Men; only that the Slit of the Nut was not perforated. Such another Engliſh *Hermaphrodite*, about 22 Years of Age, in the Year 1668, we ſaw at *Utretcht*, whoſe Governour reported that he was born a perfect Girl, but that when ſhe came to be about five or ſix Years of Age, her Genitals began to be changed, and by that time ſhe came to be ten Years old, her Yard became conſpicuous. We ſaw the Yard hanging forth about half a Finger long, but the Slit of the Nut was not perforated, otherwiſe not unlike a Mans Yard, the *Præputium* of which was form'd by the Cloſure of the *Nymphs*: which half covered and uncovered the Nut as in Men. And this Yard would upon venereal and laſcivious Thoughts erect it ſelf a Fingers length, as his Governour reported. In each of the Lips of the Privity, as in ſo many Cods, one Stone was contained. A little below the *Clitoris*, was the urinary Paſſage, and the Sheath of the Womb. His Governour related that he had his monthly Courſes at ſet times like other women; and in height of Luſt the Seed would flow forth: but that the *Hermaphrodite* himſelf could not tell whether it flow'd through his Yard, or from his Female Privities. His Duggs, that were but ſmall, and his hairy Breaſt and Thighs, ſeem'd to denote ſomething Maſculine, as alſo his Voice and his Hair, which was very thick and curling, with the Beard apparently beginning to ſhoot forth upon his Lips. At firſt he wore womans Apparel, but the next Year, when I ſaw him again at my own Houſe, by reaſon his Beard grew ſo notorious, he altered his Habit, and put on Mans Apparel. From whence it appears that theſe *Hermaphrodites*, are not ſuch as partake of both Sexes, but are really women, whoſe Genitals are not rightly form'd, while the Stones fall down into the Lips of the Privity, and the *Clitoris* grows out to an extraordinary Length.

Whether the Seed paſs thorough the Clitoris.

XLVI. Here ariſes a very weighty Queſtion, whether your *Confricatrices* and *Hermaphrodites*, lying with other women, ſpend any Seed through their *Clitoral* Yard, and eject it into the Womb? I muſt confeſs I was once ſo much for the Affirmative, that I maintained it in the firſt Edition of my Anatomy: thinking it might be confirm'd by Reaſon and Experience. *By Reaſon*: Becauſe I thought it no more a Wonder for the Seed to paſs the inviſible Pores of the Slit of the *Clitoris*, than in Men for it to paſs from the Stones to the Urinary Veſicles, through the inviſible Pores of the *Vaſa deferentia*. Add to this, that thoſe female *Rubbers* do not feel leſs Pleaſure in that Coition, than Men in

their Copulation with Emission of Seed. *By Experience*: Because I my self formerly knew a woman, of no mean Quality, that made her Complaints to me, that when she was young, and feeling the Itch of Lechery, she was wont often to rub her *Clitoris* with her Finger, and so was wont to provoke her self to spend her Seed with great delight: But in progress of time this ill Custom turn'd to a Distemper: So that if her Privity were never so little touch'd either by the Cushion where she sate, or by her own Drawers when she walk'd, or by any other manner of way, presently her Seed flew from her whether she would or no, neither was she able to retain it at her own Pleasure; upon which she came to me for Remedy. She told me moreover that she could certainly feel her *Clitoris* swell and itch upon the least wanton Thought, and that she certainly believ'd, that the Seed which was provok'd by the rubbing of her Finger flew out from that part, meaning her *Clitoris*.

Here comes in a remarkable Story, related by *Jacob Duval Tract. de Hermaph.* with the whole Proceedings of the Court upon the Tryal: Where among other things he reports, that a certain Widow woman, who had two Sons living, by her deceased Husband, and was married the second time, through Ignorance, to a *Hermaphrodite*, confessed that the said *Hermaphrodite* one Night entered her Body four times, and so strenuously and naturally did her business, that she never lay with her Husband with more Pleasure. Which Reasons and Examples seem'd formerly to me to prove that your female Rubbers and *Hermaphrodites* lying with other women, eject their Seed out of the *Clitoris*, as Men out of the Yard. But because in this Age Anatomy grows still to more and more Perfection, through the great Diligence and Labour of many eminent Persons, hence it came to pass that by frequent Examination and Inspection, I found the round Ligaments of the Womb not to be the ways through which the Seed could be carried to the *Clitoris*; nor that there was any *Urethra*, nor any thing like it in the *Clitoris*; nor that any Seed could pass through its Slit, and therefore of necessity it behov'd me to recant my former Opinion; finding the forementioned Reasons and Examples not sufficient to defend it. For as to that woman that provoked forth a seminal Matter by the rubbing of the *Clitoris*, 'tis very likely that that same viscous Matter flew out of the foresaid *Prostates*, into the *Vagina*, as it is frequent with Men to spend upon rubbing their own Yards; and then bursting forth of the Mouth of the Sheath, moisten'd the *Clitoris*, which deceiv'd the woman and made her think that the Seed flew out of the *Clitoris*. The same is to be said of other *female Rubbers* exercising other women, as also of *Duvals Hermaphrodite*, whose wife thought he had spent into her body through his extended *Clitoris*. Which Error proceeded from hence, that while her Husband rubbed the sheath of her womb with his *Clitoral* Yard, the viscous Matter being provoked out of her *Prostates* by the Pleasure of *Frication*, flew out into her *Vagina*, with which Pleasure the woman being ravished and deceiv'd, thought it had proceeded from the Seed ejected into her womb by the *Hermaphrodite*. But all these things being more seriously considered, most certain it is, that no Seed of women is evacuated through the *Clitoris*.

Digression.

XLVII. *Thus having describ'd all the Parts of Women serving for Generation; here are two Questions to be answered.* First, *Whether the Genitals of Women differ from those of Men but only in Situation.* Secondly, *Whether a Woman may be changed into a Man.*

Whether the Genitals of Men and Women differ in nothing but in Situation.

XLVIII. *As to the first,* Galen *seems to demonstrate and teach it, in his Book* de usu Part. *with whom many both* Grecians *and* Arabians *take part, who unanimously affirm that the Genitals of Women differ only in Situation: The one by reason of the colder temper of Women and weakness of Nature being conceal'd within, the other by reason of the extraordinrry Heat and Strength of Nature, being thrust forth of the Body.* For that if the womb should be thrust forth, it would hang with the inside turn'd the outside, and the external smooth and equal part would become the innermost, and the inner rugged and unequal side would become outermost, and so form a Cod, and the Stones that cleave to the sides within the *Abdomen*, would be contained in that innermost *Scrotum*, which *Scrotum* were to be distinguished with a Seam in the middle, as the womb is distinguished within, to which the *Clitoris* being remov'd would form a Yard above it. *Or* if the Mans Cod should be forc'd toward the inner

Parts,

Parts, then it must have the form of the womb within the *Abdomen*; and the Stones contain'd therein must cleave to the sides on each side, and the Yard drawn in, must be hid like the *Clitoris*.

The instruments of Generation differ in each Sex, being compar'd.

XLIX. ***But tho' this most ingenious Contrivance be adorn'd with some probability, yet certain it is, that the Genital Parts of both Sexes, tho' they seem in some things to resemble one another, but only in Situation, nevertheless they differ very much in many things.***

For 1. in women, the *Arteries* and *Veins* are much shorter, and more twisted than in men. 2. They want the *Pyramidal* Body form'd out of the Veins and Arteries, before their entrance into the Stones. 3. Secondly they want the *Paraſtates* and Seminal Vessels. 4. Their *Proſtates* are of a different shape from those of men. 5. The *Tubes* are wanting in men; and the *Vasa Deferentia* are of another sort than those in women. 6. The *Testicles* differ in bigness and shape; being much less, more moist, and lither in women than in men. 7. The *Substance* of mens Stones consists of Seminary Vessels (with some few *Vasa Sanguifera*) interwomen one within another; but the Stones of women consist of *Membranes*, *Vessels*, *Cups*, *Vesicles*, and other Bodies. 8. The *Clitoris* differs very much from the man's Yard in length and thickness; neither is it perforated with any conspicuous hole like the Yard. 9. There is no *Urethra* in the *Clitoris*. 10. The *Scrotum* differs extreamly from the *Substance of the womb*, as being that which in the womb is thick, compacted and nervous, and in women with child grows to the thickness of two fingers: in the Cod the skin is soft, wrinkled, and never increases in thickness. 11. In Brutes, who have a horned womb, it is apparent, that the womb turn'd inside outside, will not form a *Scrotum*, tho' their Males have a *Scrotum* like the *Scrotum* of men: in their Females nothing like a *Clitoris* or a Yard was ever yet discover'd: or if the *Scrotum* should be turn'd to the inner parts, could the Yard supply the place of a *Clitoris*, seeing that in a *Dog*, a *Wolf*, a *Fox*, and several other Creatures, the Yard is inwardly bony. So that if it were true, that the Genitals in men differ'd only in Situation, the same also would happen in Brutes; which, as is obvious to any man, neither is nor can be. When it is apparent that the secret Parts of men and women differ not only in *Situation*, but in *Substance*, *Bigness*, and *Use*.

Whether women may be chang'd into men.

L. ***As to the latter, Whether women may be chang'd into Men, Experience seems to confirm it as a thing most certain, and the Authority of Histories: For there are several Stories of Women chang'd into Men.*** *Pliny* writes, that in the Consulship of *Licinius Crassus*, and *Cassius Longinus*, there was a Child born at *Cassinum* of a Virgin, which by the command of the Southsayers, was carried into a Desart Island. He also relates what *Mutianus* asserts, That he saw a Maid at *Argos*, who after she was married, became so much a Man, with Beard and all other Virile parts, that she afterwards married a Wife: and that of the same sort he saw a little Boy at *Smyrna*. *Pliny* adds, That he saw in *Africa*, *L. Cossicius*, a Citizen of *Trisidis*, now *Tensert*, who being a Female, and married, upon the very Wedding-day was changed into a Male. Among our Modern Authors Cardinal *Volaterran* under *Alexander* VI. attests that he saw a Virgin, who had a Yard that fell down upon her Nuptial day. *Pontanus* tells us of a Woman of *Cajeta*, a Fisherman's Wife, that became a Man, after she had been fourteen years a Woman: and the same thing happen'd to *Emilia* the Wife of *Antony Spensa*, a Citizen of *Eboli* in the Kingdom of *Naples*, ten years after she was married. With several other Examples brought, *Duval*, *Merula*, *Donatus*, and others, which seem to confirm the Affirmative part.

But if we consider the thing more narrowly, it is sufficiently apparent that all *Historians* that wrote those Stories, gave too much credit to Vulgar Report, without inquiring as they ought to have done, into the truth of the Matter.

Observations.

LI. 1. ***We read that it has so fallen out, that some Males, tho' very rarely, have had their Yards that have lain latent within the*** Abdomen; ***as we our selves have seen the Stones lye hid in the Groyns more than once; and hence the Midwives and Women finding the Yard as it were laid up in a Cleft, took the Infant that was born to be a Girl, and took care that it should be baptiz'd as a Girl: but afterwards Youth and Puberty coming on, the latent Pintle swelling in the heat of Lust, broke loose from its narrow Confinement.*** But such Men were not

Wo-

Women before, tho' ſo adjudg'd by ignorant Women, and Men altogether as idle, till their Genitals making way in the heat and fury of libidinous deſires, they were thought to be chang'd out of Women into Men; and ſuch were all the Accidents mention'd in *Pliny* and *Volaterrane*, in which Examples there is no more to be obſerv'd, but that the Yard broke forth upon the Nuptial day, when looſe Deſires and amorous Flames had warm'd and heated all the Body.

2. As we have already obſerv'd, in ſome Women of full Age, the *Clitoris* ſometimes grows to the bigneſs of a Man's Yard, inſomuch that they are able to lye with others of their own Sex; and when that happens, what wonder is it if the ignorant Vulgar perſwade themſelves that ſuch Women are changed into Men: and ſuch as theſe ſeem to be the Accidents related by *Pontanus*.

3. Many times it happens, eſpecially among Perſons of great Quality, that the Mothers apprehenſive of ſome danger, either from Enemies, or loſs of Inheritance, warily and prudently conceal the Male Sex, diſſemble a Boy to be a Girl, and to that purpoſe all the time of their Childhood, put the Boy into Girls apparel: but at length the Sons contemning their Female habit, have put on Man's clothes, which might cauſe a report among the Vulgar, that the Girls were chang'd into Boys. Thus in the time of *Ferdinand* the firſt King of *Naples*, *Carola* and *Franciſca*, the two Daughters of *Lewis Guerna*, were ſaid to have chang'd Sex at fifteen years of Age. I ſhould rather have ſaid, had chang'd their Apparel: For no queſtion, but to conceal their Sex, ſo long they went in Womens Apparel, which at fifteen years of Age they threw off; fearing otherwiſe to be betray'd by their Voices, and the budding forth of their Beards, whatever *Fulgoſus* invents to the contrary.

4. Sometimes it happens that ſome are born *Hermaphrodites*, and becauſe it is counted an abominable thing to partake of both Sexes, their Mothers make it their buſineſs to hide that defect from their very Cradles, and to bring up ſuch Children in Womens habit; but then, if at any time appinted their Beards begin to grow, they are forc'd to change their habit: and ſo are ſaid to be chang'd from Men to Women.

5. Sometimes it happens through an extraordinary change of Temper that ſome Women come to have Beards and deep Voices, which is the reaſon the Common People think 'em to be chang'd out of Women into Men. Thus *Hippocrates l. 6.* tells us of two Women, *Phaetuſa*, the Wife of *Pythias*, and *Lariſſa* the Wife of *Gorippus*, who by reaſon of the ſuppreſſion of their monthly Flowers, became deep voiced, and bearded like Men.

LII. *And thus moſt certain it is, that never any Woman chang'd her Sex, or can change it; but that whatever* Hiſtorians *have written concerning theſe Metamorphoſes, are all idle and ridiculous Fables: while they, being over-credulous, were deceiv'd by Vulgar report, and not examining the Truth, as they ought to have done, contrary to what they intended, obtruded Falſities upon their Readers.* *No woman ever chang'd her Sex.*

Laſtly, we ſhall add this, That if Women at any time were ever chang'd into Men, without doubt Men were ſometimes chang'd into Women. Which nevertheleſs was never heard of: and the reaſon is, Becauſe the Yard being hid up in a Chink reſembling the Female Cleft, may ſwell and break forth in the heat of Youth; and ſo the Perſon thought to be a woman, becomes chang'd into a Man: but being once pendant without, can never be drawn back, to form a Woman's Privity.

CHAP. XXVII.

Of the Conſtitution and Frame of the Female Genital Parts in Women with Child.

THo' the Generative Parts of Women are ſo conſtituted as we have deſcrib'd, yet of neceſſity there is ſomething more to be added, how they are alter'd in Women with Child, and to ſhew the difference between empty Women and Women with Child.

I. *The Womb in empty Women is about the bigneſs of a Wallnut, or a good Pigeons Egg; of a fleſhie, nervous, ſolid, and ſomewhat hard Subſtance, the Concavity within being very ſmall*; which Form and Conſtitution it ſtill retains in the beginning of Conception, *The womb in empty women.*

ception, when first it clasps it self about the Seed retain'd.

In women with child. II. *The Birth encreasing, this Substance becomes more soft and spungy; and by degrees, as the birth grows bigger, so the Substance enlarges it self, and the Womb grows thicker.* And so the Birth and its Habitation encreases together to that degree, so that at length about the upper part of the bottom, it comes to be as thick as a Man's thumb, or the breadth of two fingers.

The swelling of the Breasts. III. *By that time a Woman is half gone, the Breasts begin to swell, and the Teats being squeez'd, the Milk comes forth at first more watery, afterwards thicker.* At the same time the place above the Paps enlarges circularly, and the Teats before contracted grow more loose and tumid; the Lips also of the Privity swell out fuller and rounder.

The straitning of the Orifice. IV. *The Orifice of the Womb within is clos'd up, and so continues exactly clos'd all the time the woman goes with child, being damm'd up with a kind of viscous Slime; so that nothing can flow out of the womb, nor any thing be admitted into it: unless by chance, in a very lustful Copulation, happening to gape somewhat wider than ordinary, it receives the Male Seed, which occasions a Superfœtation.* The same Orifice in the first Months of Child-bearing, is hard, but afterwards hard and pulpous.

The Situation of the Guts. V. *The womb increasing in bigness, the small Guts separate themselves to the sides of it: If the Birth incline more to the right side, the Guts are driven to the left side, and so quite the contrary: and hence it is that women believe they have Twins.* At the same time the Caul is forc'd upward; concerning which *Riolanus* observes, that if it wrap it self about the Stomach, the woman has no Appetite to her Victuals all the time.

The Situation of the Stones. VI. *The Stones, which in empty women are rounder and looser, and rest upon the upper part of the womb, in women with child, by reason of the enlargement of the womb, seem to descend; and first to rest upon the middlemost, afterwards upon the lowermost sides of the womb.* Moreover, after the sixth Month, they become more contracted, flatter, and somewhat long; and the Spermatic *Veins* are much bigger than the *Arteries*.

The condition of the Neck. *The Relaxation of the Orifice.* VII. *The Neck is drawn upward, longer, but narrower: And two Months before the Birth, the inner Orifice of the womb becomes more loose and tumid, and by degrees dilates it self as the woman grows nearer her time, unfolding it self like a Rose;* as if Nature were preparing a way for the Birth to grow forth; in which work she is not a little assisted by the weight and strong motion of the strugling Infant.

In the last Month the Lips of the Privity become more soft and more tumid: and the neck or sheath of the womb, being press'd by the weight of the Infant, is so shorten'd, that the mouth of the womb may be easily felt by immission of the finger.

In the last two or three weeks before the woman's time, the foresaid Orifice of the womb is moisten'd with a certain glutinous and viscous Humour, to render it more loose, and apt to gape, and be dilated without violence, and give the freer passage to the Infant in going forth.

Bigness of the Vessels. VIII. *From the Stones to the Tubes, the bottom of the womb, and neck, the Vessels are bigger, and more apparent than usual. For* Cornelius Gemma *observes, that Vessels of the womb it self are more distended and tumid after many Labours.* But that seems too hyperbolical which *Bartholine* writes, that the Vessels of the womb in time of Child-bearing, swell with Blood to that degree, especially near the time of Delivery, that the Emulgents are half as large as the *Aorta* or *Vena cava*. I have seen 'em very large indeed, but never so large. But perhaps he wrote this upon the Dissection of some Female Elephant. And yet *Regner de Graef* confirms the same thing: *In women with child*, says he, *I have sometimes seen those Vessels dilated to that degree, that I could easily thrust my finger into their hollowness; which after the Evacuation of the* Secundines, *are so contracted again, that in sixteen days space, together with the womb, they recover their wonted proportion; only that they are more twisted and contorted in those that have had many Children, by reason of their being extended more in length.*

The reason why the Vasa Sanguifera *are so much dilated in women with child.* IX. *The reason why the* Vasa Sanguifera *are so much dilated in women with*

with child, is ſaid to be the neceſſity of a greater quantity of Blood, requiſite in that place for the Nouriſhment of the Infant. But in regard the forcing of the Blood through the Arteries, is ſwift enough for the Nouriſhment of all the Parts, and that without any extraordinary dilatation of the Veſſels, and for the ſame reaſon ſufficient for the Nouriſhment of the Birth in the womb; therefore there ſeems to be another quite different Reaſon of this dilatation: that is to ſay, *Becauſe that through the increaſing of the Subſtance of the Womb, and the weighty bulk of the growing Infant, the Veins of the womb being more than uſually compreſs'd, will not permit ſo free a Circulation of the Blood as in empty or free Women.* And ſeeing that more flows in through the Arteries, than can paſs through the compreſs'd Veins, and be remitted back time enough to the heart, hence it is that the Blood, by reaſon of its ſlower Circulation, which in the mean time is forc'd through the Arteries with an equal Chanel, being there detain'd and collected together in greater quantity, more and more diſtends the *Sanguiferous* Veſſels, ſo that toward the time of Delivery they are more than uſually large. Which nevertheleſs, after Delivery, the ſaid Compreſſion ceaſing, and the Circulation becoming free, within a few days are contracted by the Fibres themſelves, and return to their firſt Condition.

In like manner the ſame thick Subſtance of the womb, no leſs than the Veſſels, preſently after Delivery, and the Evacuation of the *Secundines*, begins to fall and dry up, ſo that in a few days it recovers its priſtine ſolidity and hardneſs; and this ſometimes in ſix or ſeven, ſometimes in fourteen, or more days.

All which things the accurate inſpection of many Child-bearing women, and women with child hath taught us.

CHAP. XXVIII.

Of the Seed.

HAving examin'd the Parts of Generation, Order requires that we ſhould proceed to the Hiſtory of the Birth contain'd in the womb. Which before we begin, we ſhall premiſe ſome things concerning the firſt Foundations and Principles of the Birth: Beginning firſt with *Human Seed*; and diſcourſing in the next of the *Conception*, and the *Forming* of the Birth.

The Name. I. *The* Seed *is ſometimes call'd* Sperm, *ſometimes* Geniture. *And tho'* Ariſtotle *ſeems to make ſome diſtinction between* Sperm *and* Geniture, *as if the one were the Seed of thoſe that copulate, the other of thoſe that never engender; and tho' others take* Geniture *for that Seed only which may properly be call'd fruitful; others for the Seed of man and woman mixt together: Nevertheleſs, becauſe the ſame Philoſopher confounds theſe Names up and down in other places, as alſo* Galen, *and many others do, we alſo intend to make uſe of theſe Names for one and the ſame thing.*

But becauſe in Generation there are two Seeds that come to be conſider'd, of which neither can produce any thing apart; but which being duly mixt together to perfect Generation, I think it will be moſt beneficial to diſcourſe firſt of the Seed of man, and then of the Seed of woman apart, and of what proceeds from the mixture of both.

Definition. II. *The Seed of man therefore is a frothy, white, viſcous Liquor, impregnated with a germinating or bloſſoming ſpirit, made in the Stones and other Spermatic Veſſels of Arterious Blood and Animal Spirits, for the Generation of a like Creature.*

We think that Opinion to be rejected as unworthy refutation, maintain'd by *Ariſtotle*, and aſſerted by his Followers, that the Seed is an Excrement of the third Concoction, when as it is the moſt noble Subſtance of the whole Body, as it were a *Compendium* of the whole Man; or at leaſt ſuch a Subſtance as contains in it ſelf the *Compendium* of all Mankind.

In what Parts it is generated, we have ſufficiently explain'd *Cap.* 22. and *Cap.* 24.

What the Matter of it? III. *Of the Matter of which Seed, is generated, and the Parts out of which that matter proceeds, various are the Opinions of Philoſophers.*

The opinion of the Ancients. IV. Avicen *ſays, That the Seed proceeds from the Brain, Heart, and Liver. Some think it falls from the more ſolid Parts into the leſſer Veins, and*

and from those ascends into the greater, and like a little Cloud or Settlement, swims upon the rest of the Humours, and at length is attracted by the power of the Stones. The reasons of which Opinions, and their Refutations, may be seen in *Aristotle*, *Fernelius*, *Laurentius*, and *Vallesius*.

The Ancients say it is made of the Juice falling from the Brain and Spinal Marrow.

V. *Many of the Ancients likewise have asserted that the Seed is made of a certain Juice that falls from the Brain and Marrow of the Back-bone.* Thus writes *Hippocrates l. de Gen.* that the Seed is diffus'd out of the Brain into the Loyns and Marrow of the Back-bone. Thus also writes *Plato* in *Timæus*, That the Seed is a Deflux of the Marrow of the Back-bone; and *Alcmæon*, that it is a Portion of the Brain.

The opinion of Modern Authors.

VI. *The more Modern Authors, who could find no such large Conveyances from the Brain and Spinal Marrow to the Stones, rejected the foresaid Opinion altogether, and asserted the Blood to be generated out of the Blood flowing through the Spermatical Vessels to the Stones.* Which Opinion, as most true and indubitable, for many Ages has been receiv'd and taught by all the Philosophers.

Opposed by some English Physicians without Reason.

VII. *But of late* Glisson, Wharton, *and* Charleton, *English Physicians, have oppos'd this receiv'd Opinion, who write that the Matter of the Seed is a more crude and chylous Humour, carried from the Mesentery to the Brain, and thence to the Stones through the Nerves, of which they say there are a vast number inserted into the* Testicles *and* Epididymis: which is contrary however to all Experience; when our own Eyes tell us, that only very few, and those very small, and scarce visible, Nerves reach to those Parts.

Clement Niloe's *opinion erroneous.*

VIII. Clement Niloe *produces another Opinion, affirming the Seed to be generated out of the* Lymphatic Liquor. But in regard the *Lympha* never flows to the Stones out of any other Parts, but while the Seed is making, is separated out of that Seminal Matter, and out of the Testicles themselves through the *Lymphatic Vessels* that take their rise within the *Testicles*, ascends to the *Abdomen*, and so to the *Vasa Sanguifera*, it is apparent that the Seed is not made out of the *Lympha*; but that the *Lympha* is only occasion'd by the making of the Seed; as it is also an Effect of the making of *bilious Ferment*, *Cap.* 13, 14. Moreover, if the *Lympha* should be carried to the Testicles, as it is not, and in them should be mix'd with the Matter that is to be chang'd into Seed, then it would not hold proportion with the Matter so to be chang'd into Seed, but only with the Ferment preparing the Matter, that it may be conveniently turn'd into Seed. So that *Niloe* does not seem to have observ'd the Motion of the Stones upward, nor to have understood the use of it, *Cap.* 13. & 17.

Barbatus *of* Padua *his opinion.*

IX. Hieronymus Barbatus *of* Padua, *seems not to recede far from this Opinion, who* Lib. de Sang. & Sero, *writes that the Seed is not generated out of the Seed, but out of the* Serum. *Which Opinion he endeavours to support with many, but such insipid Reasons, as are not worth Refutation. But none of these, either Modern or Ancient Opinions, have hit the Mark.* But he who considers more seriously the Prolific Liquor, will certainly find, that to the making of the Seed there concurs for Matter, *partly Blood*, flowing through the Spermatic Arteries; *partly Animal Spirits* brought through the Nerves.

The true Matter of the Seed.

The Blood constitutes the first Mass of Seed.

X. *That the Blood constitutes the first Mass of the Seed, is apparent from the large Spermatic Arteries carried to the Stones, which carry more Blood than only serves for the Nourishment of the Stones. The same is confirm'd by the Spermatic Veins, carrying back to the* Vena Cava *the Blood that remains after the Nourishment of the Stones, and making of the Seed. The same is also taught by Experience, when upon immoderate Copulation, we shall find the Blood to be ejected instead of Seed, not without some kind of Titillation*; as *Aristotle* himself acknowledges, and the observation of several Physicians testifies, by reason that the Blood flowing in great quantity through the Arteries, has not sufficient time to stay in the Stones, nor Animal Spirit pour'd out of the Nerves strong and plentiful enough, that the Blood could be converted into Seed in so short a space. Add to this that in the Stones themselves, and other Spermatic Vessels weaken'd by immoderate Copulation, and the overmuch dissipation of the Spirits, the Seminific power becomes debili-

tated so far, as not to be able so speedily to convert into Seed the Blood which is brought, being destitute of sufficient Spirit from the Nerves. Which weakness is apparent from hence, that after immoderate Copulation the Seed first generated is crude and watery. And this Experience Reason supports, which teaches us that the Blood concurs in the Seed, as the primary and greatest part of the Matter. For that in our Bodies all things are enliven'd by the Vital Spirit flowing from the Heart; and inherent in the Arterious Blood, and that decaying, nothing can be reviv'd: for that if upon any occasion that Blood be stopp'd from flowing into the parts, they presently dye away. Hence of necessity that enlivening Spirit must be infus'd into the Seed, as containing in it self an enliveningPower, chiefly requisite in the Seed: which Spirit, since it cannot be confer'd without the Subject to which it is inherent, that is, *Arterious Blood*, hence it follows undoubtedly, that the Blood concurs to constitute the Matter of the Seed.

That the Animal Spirits contribute to the making of the Seed.

XI. *Now that the Animal Spirits, brought by the Nerves, and thicken'd in the Stones into a thin Liquor, and mix'd with the Blood, of necessity concurs to the Matter of the Seed, is apparent from hence, that there is a great Correspondence between the Brains and the Testicles, in regard the Brain, the Nerves, and all the nervous Parts are much weaken'd by immoderate Copulation; and in regard that the waste of much Seed, wasts also a great part of the Animal Spirits, attended by lassitude and a manifest impairing of the Strength, together with sadness and dejection of Mind; there is thereby a disturbance in a Man's Countenance, accompanied with a trembling of the Limbs; all which things declare that the Animal Spirits are plentifully evacuated with the Seed.* Which Seed, if it were only made of the Blood, such Symptomes would never attend the Evacuation of a little Seed; for that a whole Pint of Blood taken from a Man, does not weaken him so much as the loss of an Ounce of Seed. To this we may add the Consideration of the Spinal Consumption, thus described by *Hippocrates*, *Lib.* 2. *de Morb.* *The Spinal Consumption*, says he, *arises from the Marrow of the Back-bone, and chiefly seizes upon new married and libidinous Brides. Concerning which, if you ask the Patient, he will tell you, that he feels as it were Flies and Emmets creeping along from the upper parts, as the Head, &c. down to the Back-bone. And when he goes to Stool, or makes Water, he voids a great quantity of Liquid Genital Seed; nor can he generate, tho' he lyes with his Wife. He is the Laughing-stock of* Venus, *and suffers Nocturnal Pollutions as well as at other times: but especially when he has travell'd a steep place, or run hard; he draws his breath short, he loses his strength, his Head akes, and his Ears sound.*

By the Description of this Disease, it is sufficiently manifest, that there is a certain Spirit that flows through the Nerves from the Brain and Back-bone to the Composition of the Seed. For hence it is that the Brain, being weaken'd after immoderate Coition, there happens a Defluxion of Spirits not sufficiently concocted, but crude, from the Brain to the Spinal Marrow, whence happens a Colliquation, and a flagging and looseness of the Nerves. Hence Nocturnal Pollutions in the sleep, the Spermatic Vessels being weaken'd by immoderate Coition, and having lost their retentive Faculty: besides that that same crude and unconcocted Spirit flowing through the Nerves, becomes somewhat salt and acrimonious, and with its Acrimony vellicating and tickling the weaken'd Genitals, provokes them to an Effusion of Seed.

Salt the chief Composition in the Seed.

XII. *Now this Animal Spirit diffus'd through the Nerves from the Brain to the Stones, and there thickned into a thin Liquor, there in that same Contexture of small Vessels, of which the Substance of the Stones consists, is mingled with the spiritous Blood, and by slightly fermenting it with its Acrimony, and separating the Lymphatic Juice, which is to be carried upward through the Lymphatic Vessels, rising out of the Substance of the Stones, to the inner parts of the* Abdomen, *by the means of certain small, scarce visible Glandules, dispers'd among the small Vessels of the Testicles, specifically dissolves the saltish Particles of it, and separates it from the Redundancy of the Sulphurous Liquor, with which salt Particles, and some few Sulphury, in its long and winding passage through the small Vessels of the Stones, by a specific Faculty of the Stones themselves it is concocted*

cocted into Seed, which flows from the Parastates *through the* Vasa Deferentia *into the Seminary Vesicles, where it is condens'd into a frothy Liquor, and is reserv'd till the time of Evacuation.* Now because this salt Liquor has the greatest share in the Composition of the Seed, and that its fruitfulness and balsamic Power chiefly proceeds from thence, the Ancients feign'd that *Venus* sprang out of the *Sea*, and gave the Appellation of salacity to Lust.

The Proof. XIII. *Now that the salter Particles of the Blood separated by a certain Effervescency, necessarily, and in great quantity concur in the Composition of the Seed, and far exceed the sulphury Particles, various Arguments assure us.*

First, Because in fat Bodies, where fat and sulphurous Humours predominate, there is little Seed generated, and hence they have little proclivity to Venery.

2. Because in drier Bodies, where salt Humours predominate, much Seed is generated, which make 'em more able for the Sports of *Venus*.

3. Because the subacid Seed exhales a kind of smell, which must necessarily proceed from a dissolv'd Salt.

4. Because the increasing of that in quantity excites an itching Titillation, and provoke to Lasciviousness.

5. Because the Fertility of most things proceeds from Salt, either melted or dissolv'd by heat, and thence it is no wonder that the fœcundity of Human Seed chiefly depends upon it. The first is apparent from many Experiments. *Wood-ashes, especially of Burnt-oak, strew'd over the Fields, renders 'em much more fertile, and that Fertility is more lasting than the spreading of Cow-dung over the same Fields, which only causes a Fertility quick and of short durance: Because they contain a greater quantity of Salt, which being melted by the Rain, and attenuated by the heat of the Sun, augments that Fertility of Grass and Herbs. Grounds dung'd with the Dung either of Men, or Pigeons, or Poultry, enfertilize those Lands ten times more than either Cow or Horse-dung; because the other contains ten times a greater quantity of balsamic Salt.* Rain-water impregnated with much volatile Salt, attenuated by the heat of the Sun, and with the watery Vapours exhal'd and thickned into clouds, causes the Herbs and Plants to flourish and grow to a greater Perfection, than if water'd with other Water. Hence *Aristotle* writes in his *Hist. Animal. l.* 8. *c.*19. that Reeds which grow in Lakes and Ditches, never thrive so well as when great store of Rain falls. In like manner Fish in their Ponds thrive much better when it rains. The Dew impregnated with a Volatile and Balsamick Salt, produces several sorts of Worms and Insects upon the Trees. In Vinegar expos'd to the Sun, and long kept, we find many times little Worms to breed; concerning which thing, *Bartholine* gives us a remarkable Observation, *Hist. Anat. cent.* 4. *hist.* 13. who admires it indeed, but seems not to understand the Reason. Which is plain, because the whole Acidity of the Vinegar proceeds from the Salt being exactly melted and dissolv'd; which appears from the Spirit of Salt, which is most acid, and for that common Salt being boyl'd with Vinegar, renders it much more acid. Now the thinnest Particles of this melted Salt, attenuated and volatiliz'd by the heat of the Sun, agitate the Particles of the Vinegar with particular Motions, and so joyning with some after one, with others after another manner, beget a kind of Fertility which breeds Worms, enliven'd by the Beams of the Sun.

And thus I think we have sufficiently prov'd that there is a very great balsamic power in Salt, and that the fœcundity of all things living proceeds from and out of Salt. So that it need not seem a wonder, that more salt Particles should be requisite to compose the Matter of Seed than sulphury Particles. But I have told you that they are plentifully separated from the Blood by a certain way of Fermentation, caus'd by the Animal Spirits flowing to the Stones; which Animal Spirit consists of salt, sharp Particles.

When the Seed is well made. XIV. *Now if the Animal Spirits flow through the Nerves in sufficient quantity, and strong enough, to the Stones, and there be concocted into a spiritous Liquor, together with the said spiritous Salt part of the Arterious Blood, or be duly prepar'd and chang'd in the long windings and turnings, the Seed becomes well concocted, spirituous, and fruitful; which thickning in the Seminary Vessels, in Copulation is ejected white. But if that Spirit flow weak, and in small quantity to the Stones, the Seed then generated becomes crude, watery, and not so white,*

the Spirits being diſſipated, as it happens, through immoderate Copulation; and the Spermatic Parts become weak, frigid, and moiſt; through which ill temper of the Parts, the narrow ends of the little Nerves that loſe themſelves in the Stones, grow limber, and fall, ſo that very few Animal Spirits can penetrate to the Stones; and ſuch as paſs through are ſtifled by the extream coldneſs and moiſture of the Stones: and thence it happens that there is no convenient Fermentation in the Blood flowing through the Spermatic Arteries, but the greateſt part of it is converted into crude, wateriſh, and ſharp Juice, which being carried to the Seminary Veſicles, and there gather'd together, eaſily burſt forth into the *Urethra*, eſpecially in Venereal Dreams.

XV. *And for the ſame Reaſon the viſcous Seminal Matter, that uſes to ſettle in the* Proſtates, *is alſo crude and watery, and by its extraordinary Moiſture relaxing the Pores, toward the* Urethra *in Men, toward the Uterine* Vagina *in Women, flows forth without being felt, and unvoluntarily, which cauſes the Simple* Gonorrhea. *Which Seminal Matter, if it be infected with any impure Venereal Malignity, and ſharp Corruption, preſently happens a* Virulent Gonorrhea, *which is attended many times by Corroſion and Exulceration.* Now this Efflux of Seminal Matter, or *Simple Gonorrhea*, many times moleſts the Patient for a long time, even whole years together, with little debilitating the ſtrength; becauſe that ſpiritous Liquor coming from the Nerves, is mix'd in a ſmall quantity, with ſuch Seed, and very few or no Animal Spirits waſte themſelves in its Evacuation; which at other times in libidinous Copulation flow to the obſcene Parts in great quantity, and are diſſipated to the great waſting of a mans ſtrength: whereas there is no labour in the ſpontaneous and unfelt Emiſſion of the Seed. Thus *Bartholine* reports that he ſaw at *Padua*, a Perſon that had been troubled with this Efflux of his Seed for above thirty years, without any prejudice to his health; and another at *Bergamo* infeſted with the ſame Diſtemper for ten years, in other reſpects healthful, but only that he was very much emaciated.

The reaſon of the Gonorrhea Simplex.

XVI. *If any Perſon wonder how ſuch a ſpiritous Animal Vapour ſhould flow ſo copiouſly through ſuch narrow and hardly conſpicuous little Nerves, let him conſider that the Arteries alſo, by that time they come to the Stones, are almoſt inviſible, and yet they carry a great deal of Blood. Moreover, let him know that thoſe copious Vapours are not carried thither ſo copiouſly, by reaſon of the extream thinneſs of the little Nerves, only that they deſcend by degrees to the Stones:* And hence after a ſtout Copulation, and much Emiſſion of Seed, there is requiſite ſome ſpace of time before a ſufficient recruit can come for the generation of new Seed.

How the Matters compoſing the Seed flow together.

XVII. *But ſome will ſay, Thoſe little Nerves ſeem only to terminate in the Tunicle next wrapt about the Stones, which for that reaſon is endu'd with a quick Senſe, but never reach to the innermoſt Subſtance of the Stones, which for that reaſon is inſenſible, as is apparent from ſeveral Diſtempers, which is a ſign that thoſe Spirits cannot flow to the inner Subſtance.* I anſwer, That as there are no Nerves, ſo neither are any Blood-bearing Veſſels to be ſeen in the Stones of healthy People; however, it does not follow from thence, that there are no ſuch Veſſels in thoſe Parts, for that they are there, and in whom, and when conſpicuous, we have declared *Cap.* 22. So without doubt there are ſome ſlender Nerves in thoſe Parts, though not to be perceived by reaſon of their white Colour and extream Exility. Which Exility, and the ſmall quanity of Spirits that paſs through 'em, may be the reaſon that the inner Subſtance of the Stones is ſo dull of feeling: Beſides, that the inner Subſtance of the Stones is nothing membranous, for there is alſo an acute Senſe in Membranes; and becauſe the Stones, and other *Parenchyma's* of the Bowels have their proper and peculiar Subſtance, conſiſting of Veſſels interwoven one among another, the like to which there is not in the whole Body, beſides which, by reaſon of its ſtructure and feeling, is of an obtuſe Senſe, as the Subſtance of the *Heart*, *Lungs*, *Liver*, *Spleen*, &c. All which Parts, like the *Stones*, have their exact Senſe of feeling, lying only in the Tunicle that enfolds 'em.

An Objection anſwered.

XVIII.

A Difficulty.

XVIII. *But here another Difficulty ariſes, more weighty than the former, that ſeeing the animal Spirits are every way diſpoſed of by the Mind, now here, now there, at pleaſure, why they are never copiouſly diſpoſed of to flow into the Teſticles, and cauſe 'em to ſwell, eſpecially upon luſtful Cogitations?* I anſwer, thoſe Spirits are not unequally diſpoſed of to any Parts, but firſt to thoſe that require ſome ſhort ſtretching forth, to the end they may act, or act more vigorouſly, as the *Eyes, when any thing is to be view'd with more attention*; *the Womb, when the Birth is to be expell'd*; *the Genitals in Copulation*; then and chiefly then they are diſpoſed of to thoſe parts that ſerve for voluntary Motion, as the *Muſcles*. But they flow always equally with a continued Courſe to the Parts only ſenſitive, as alſo to thoſe Parts wherein they contribute any thing to Nouriſhment or Fermentation, as being an Influx that has nothing common with the Will: And that they flow ſometimes in leſs, ſometimes in greater Quantity to thoſe Parts which are ſenſitive, and ſo occaſion a quicker or a more obtuſe Senſe of Feeling, that happens not through the determination of the Mind, but by reaſon of their greater or leſſer quantity, or the largeneſs or narrowneſs of the Paſſages. And thus the Animal Spirits flow to the Teſticles, not by any determined, but meerly by a natural Motion.

Two parts of the Seed.

XIX. *Now in the Seed thus made of the ſaid Matter, two parts are to be conſidered: Some ſubtil, and very ſpirituous, which are very few, but very effective: Which we now call the* Germen *or* Bloſſom: *Others thicker, frothy and watery, which conſtitute the chiefeſt part of the Seed, and nouriſh and involve the ſpirituous Parts.*

Thick and ſpirituous Parts mixed and clotted together compoſe the Maſs of the Seed.

XX. *Now theſe ſpirituous and thicker Parts being mix'd and clotted together compoſe the Maſs of the Seed, containing in themſelves a double Principle, an Efficient and a Material. Which Material is double, the one out of which the firſt Threads of the Birth are form'd, which is the moſt ſpiritnous Part, containing the efficient or forming Principle; the other Alimentary, being the thicker part of the Seed melted and diſſolved.*

Where the efficient Principle is wanting, the Seed is unfruitful.

XXI. *If this efficient Principle be not in the Seed, as it happens in unfruitful Seed, then when nothing can be form'd out of it, it flows away and is corrupted. But if the efficient Principle ready to break forth into Act, be deſtitute of the material Principle, by which it ought to be fomented and ſuſtain'd: Then alſo nothing comes of it, as when the Seed, the ſecond or third Day after Injection, by reaſon of ſome ſuddain Fright, or other Accident, flows out of the womb; and then nothing comes of the Bloſſom.*

But theſe two Principles being united together, act nothing upon one another but are Idle, ſo long as the material thicker Principle be curdled together; for this detains the ſpirituous efficient Principle, as it were intangl'd and lull'd aſleep, and ſo reſtrains it, that it cannot put it ſelf forth into Action. But when the thicker material Principle is diſſolv'd and melted in ſome convenient Place by the external proper Heat of the womb, then its inbred efficient Spirit by degrees gets rid of thoſe Fetters, is rous'd up and becomes free, and its Power breaks forth into Act, and proceeding through the *Uterine Tubes* to the *Ovaries*, enfertilizes the Eggs which are therein ready prepared and matur'd, and begins to act in them, and in each of them out of it ſelf to delineate and form that which is to be form'd, while the thicker parts of the Seed are melted and made fit; to receive and gently cheriſh the *Eggs* falling out of the *Ovaries* through the *Tubes* into the *Womb*. For if the Eggs ſhould fall into a dry womb, they would produce no more than the Seed of a Plant caſt into dry Ground. For as nothing comes of that Seed unleſs ſow'd in a Ground moiſten'd with a tepid Humidity, ſo nothing comes of the Egg unleſs it fall into a womb watered with a convenient lukewarm Moiſture.

An Objection anſwered.

XXII. *Some will ſay, this cannot be ſo, for the Eggs of Fowl do not fall into a moiſt womb, but into a dry Neſt, and yet a Chicken is hatch'd out of this Egg.* I anſwer, That as for Birds and other Creatures that lay Eggs, there is not the ſame Reaſon for them, neither do they require any ſuch Moiſture of the womb, or thicker part of the maſculine Seed, but only the Fomentation of Warmth. For being to hatch

hatch Chickens without themselves, provident Nature has provided for them, within the shells of the Eggs, what was requisite and could not be conferr'd by any thing extrinsic, that is a copious convenient Moisture, wherein the spirituous part of the male Seed may form out of it self what is to be form'd, and nourish it also with the same, till it comes to the maturity of a Chicken. And therefore it is that the Eggs of Fowl have a Yolk, which is deny'd to all the Eggs of Creatures that bring forth living Conceptions. In which sort of Creatures it neither is nor could be so. For they being to bring forth large Births, there could not be Nourishment sufficient contained in little Eggs, by which the Birth might be augmented and nourished to such a Bigness. Hence it is of necessity that extensive Nourishment must flow into the Eggs, and come to the Birth; and first the thicker parts of the male Seed already melted, ought gently to receive the new form'd Body and nourish it by Apposition; and then other more copious Nourishment must be conveighed by the Mother to the womb for the Nourishment of the large Birth.

Of the spirituous Part.

Having thus spoken sufficiently in general of the matter of the Seed, now let us a little more accurately consider the spirituous Part.

The Opinion of Hippocrates *concerning the spirituous part of the Seed.*

XXIII. Hippocrates *discoursing of the spirituous Part, writes in several Places, that the Seed falls from all Parts, that is to say, that something is generated in every Part, resembling the nature of the Part; which being conveighed from each part to the Stones, and mix'd with the thicker Matter, together with that same thicker Matter composes the Seed, containing in it self the Ideas of all and every part.*

Of Aristotle.

XXIV. Aristotle *ascribes a celestial Nature to this spiritual Part, like the nature of the Stars*: *For*, saith he, *there is in the Seed of all Creatures, that which renders the Seed fruitful, and is called* Heat, *and yet no Fire, nor any such Quality, but a Spirit which is contained in the Seed and frothy Body*; *as also* Nature, *that is the* Soul, *which is in that Spirit, answerable in proportion to the Element of the Stars.*

What is the spirituous Part.

XXV. *Now that we may inquire more narrowly into the Original and Nature of this spirituous Part of the Seed, we are first to understand, that it is a most subtle Body produced by another Body, having a fitness by the help of external Causes, to produce and form another Body, like to that from which it had its own Modelling.* For when this Body has gain'd a proper Matter wherein to subsist, it is together with that matter deposited in a convenient place, and freed from all Incumbrances.

It is a Body.

XXVI. *That it is a Body is apparent, because it is subject to corporeal Laws, Putrefaction, Corruption, and Change,* &c. *and is produc'd by a Body, and not from a rational Soul; from which if it were produc'd, it could not be corrupted, for that being incorruptible, must generate something incorruptible like it self.* But that it is corrupted is apparent in the Emission of fruitful Seed, from which no Conception happens; for then nothing is generated out of it, but it perishes, and is corrupted like other corruptible Substances.

It is produced out of a Body.

XXVII. *That it is produced out of a Body is plain from hence, that it is generated and not created: As also that it is produced out of the Substance of the Seed, dissolv'd by the ambient Heat and Moisture, loosning the conjoyn'd Mass of the mix'd Body, and is nothing else but a thin Vapour fluid and moveable, volatiliz'd by the Heat.* For which reason it would easily fly away unless it were detain'd, as being wrapt about by the thicker Particles of the Seed not so apt for Volatility; and by and by straitly enclosed by the womb and its proper Membranes, and in regard of its salt Particles, of which for the most part it consists, it were somewhat inclin'd to fixation, and so were hindered and stop'd in its Flight.

Its aptitude.

XXVIII. *That it has an Aptitude from the convenient Matter of which it self consists, and wherein it inheres, by the help of external Causes to produce and form a Body like to that from whence it proceeded, Experience teaches us.* But whence that Aptitude proceeds is not altogether so manifest.

XXIX.

The nature of the spirituous Part.

XXIX. *That the Figures and Forms of Bodies arise from the various Constitution, partly of the forming Cause, partly of the Matter out of which they are compounded, is a thing confessed among the Philosophers.* In Generation therefore a just and due Constitution and Disposition of the Matter is required, that the formal Cause may act upon it, and form and generate something out of it. Now the foresaid Spirit rooted in the Seed, containing in it self the forming Form, call'd *Nature*, both has and perfects that requisite disposition of Matter; and that is the first Agent or Principle of the forming of the Birth, and also the first and next Matter of the Parts to be delineated. For there is a certain efficient Spirit infused into all natural Seeds, which arising out of the thinnest and most volatile salt and sulphury Particles of the Seed it self, concocted after a particular manner by the Heat, and intermixed with the more fixed Particles of the Seed, is the primary cause of Formation, and the primary and next matter of the Body to be form'd, and actuates the other Particles of the Seed, and as it were leads the Dance of natural Motions, which being coagulated, absent, extinct or suffocated, there can be no Generation. Now if such a Spirit be contain'd in all Seeds, then certainly in the Seed of Man.

Where the Idea of all the Parts is contained.

XXX. *Now a small Particle of this Spirit contains in it self the Ideas of all and singular the Parts of the whole Body, which Parts it is able again to form out of it self, when by the Assistance of the Uterine Heat, being somewhat loosen'd and freed from the thicker Mass of the Seed, it advances toward the* Ovaries, *and enters the* Eggs, *and in them now carried through the* Tubes *into the* Womb, *it is agitated, mov'd and rouz'd into Action.* For being agitated, it acts, and acting, it cannot do otherwise, than out of that convenient Matter of which it consists it self, and where it is inherent, that is out of it self to form such Parts, of which it contains in it self the Ideas, and so by degrees renders the rest of the Matter of the Egg apt and fit, which giving way to the Growth of those Forms, may be able also to assume their Shape. Which I shall endeavour to illustrate by a Comparison. As Coles extinguished, Straw, Turf, Wood, and other Materials, do not take Fire, nor flame out, unless some subtle Matter, having the form of Fire, enter 'em, and raise the first Idea of Fire, which then makes fit the rest of the Matter, that it may be able to assume the like form of Fire: so there is no Creature of the same likeness raised out of the Egg, unless it enter some Egg, which bears the Idea of that same Creature, which making of it self the first delineation of that Creature, at the same time renders the rest of the Matter of that same Egg fit, first to increase its Delineation, and then assume the form of all its Parts. Now this is that same *Idea-bearing Spirit* ingrafted in the Male Seed, and separated from its thicker Mass by the benefit of the Uterine Heat, and so infused into the Eggs.

Ideas whence and what they are?

XXXI. *Now the Seed receives those Ideas from all and every singular Part; for as from all Bodies infinite subtle Beams issue forth, expressing the Figure and external Colour of all those Bodies from whence they flow, so also from every the smallest Particles of the Body, certain most subtil little Bodies issuing from the smallest Particles of the Body, like most spirituous Atoms, are mix'd with the said Spirit flowing from them, which then has the same Impression of the Body from whence it flow'd, and receiv'd the same small forth-flowing Body, that lighting upon the proper Subject to which it is inherent, it may be effectual out of it self to produce and form a Body like to that from which it received the imprinted Shapes.* For those most subtle Bodies flowing either from some Body, or some part of a Body, cannot but have obtain'd a model or fashioning from it, such as are the Shapes of the Things within the Bodies out of which they flow. And so the seminal Spirit obtains some propriety of those Particles of the Body, out of which it flow'd, and that not only of the Figure, but of the whole Nature.

The Properties of the singular Particles not separated, meet in every Particle and display themselves in the formation.

XXXII. *But these Proprieties of the singular Particles, are not separated in that Spirit, but fall and meet together in every Particle of it, and then display themselves again in the Formation; In like manner as a thousand Beams of visible things meet together in one Mirror, and out of them*

them distinguishes the Figures and Colours of every particular thing. And hence it is that every Particle of this Spirit has a power to form the whole Creature. Which Efficacy however is more powerful, when many Particles are collected together in one Bubble. For as a few visible Beams flowing from any thing whatever, sufficiently represent the Figure and Colour of it, and yet that Figure and that Colour are more apparently, more accurately, and rightly discovered, if many Beams concur to depaint and set it forth, as in Concave Glasses; so also the particular Particles of this Spirit have a power to form the whole, yet is the Fashioning more perfect, if many Particles endu'd with the same Power be joyn'd together, and execute their work with united force. Now if the Particles of this Spirit be collected in the Bubbles not of one, but of several Eggs, thence the Generation of several Births, for the forming Spirit has sufficient Power to form the whole in every Bubble. Which is easily observ'd in Birds. For the Sperm of a Cock, which is injected into the Hen but in a very small Quantity, but full of Spirit, when it lights into the Ovary, is dispersed through all those Eggs which are already come to Maturity; and is the sole Cause of enfertilizing the small Particles in each Egg, and being agitated by the external Heat, and the little quantity of Spirit absconded therein, is the efficient Cause of the Chicken; and also the Matter of the first Delineation.

How this Spirit comes to the Stones?

XXXIII. *Now this same Spirit flowing from the several Particles is mixed with the Blood, and is circulated together with it through the whole Body, and gives it an aptness to nourish all the Parts. For if the Blood had not something in it self like to the several Parts, it could not nourish all the Parts, and add something alike to every individual Particle.* The Particles of this Blood which are changed into Seed, contain also this same Form-bearing Spirit within 'em, which is therefore involv'd within the Seed made in the Stones, and that in a considerable Quantity, and composes its more noble and primary efficient Part, yet such as cannot subsist nor be preserv'd entire without the thicker material Part.

How these Parts are generated out of the Seed, which the Parents wanted before Generation.

XXXIV. *Here arises a difficult Question, how those Parts are generated out of the Seed, of which Parts the Parents were destitute long before Generation, seeing that no Idea, no forming Power, or Architectonic Spirit can flow from them?* I answer, that this is done, because the Imagination of the Parents supplies that Defect, who daily seeing other Infants, Boys, and grown People, born and well shaped with all their Members, firmly imagine with themselves that they shall beget the like. And so no less imprint the Ideas of the defective Parts in the said Spirit, and model both it and the whole Seed no otherwise than if the modelling had proceeded from those Parts. For how far Imagination prevails in this particular, appears in Women with Child, who by the force of Imagination only forming strange Ideas, frequently add to the Birth not only the strange Figures, Colours, and Spots of the things imagined, but the things themselves according to their whole Nature. Thus have some Infants been born with Horns, when the Mother has been so frighted by a horned Beast, that she conceived such a deep impression of that Horn, that has not only disfigured the Child with the Mold or Colour, but with the very Substance of the Horn growing out. I my self in the Year 1637, knew a Woman of thirty Years of Age in *Gelderland*, who kept an Ape with a long Tail, and took great delight in it. This Woman was about a Month gon with Child, at what time the Ape of a suddain leaping upon her Shoulders, strook her over the Face with his Tail: whence the woman conceived such an Idea of the Ape's Tail, and cherished it so strongly in her Imagination, that at length she brought forth a Child with a Tail at the end of that Portion of the Back called the *Coccyx*, thinly hair'd and of the same Colour with the Tail of the Ape, which the Surgeons having cut off at the Request of the Parents, the part gangren'd to the loss of the Childs Life. Experience also teaches us, that if a woman with Child continually and strongly think of the maim'd part of any Man, from which she took a suddain Fright, she brings a maim'd Infant into the World, tho' both she and her Husband had their Limbs perfect and quite the contrary: if she continually think of a perfect and sound Child, she will bring forth a Child perfect in its Limbs, tho' perhaps either she or her Husband might want a Limb. In like manner, a

Man

Man may more easily imprint into the seminal Spirits the Ideas of Parts defective, than the Woman through her Imagination can deface, alter, or deprave those parts: And as this is certain of a woman by Experience, the same is still more certain of a Man. Neither is it to be questioned but that if the Parents think continually and much upon those defective Parts, nor by other Imaginations imprint in the seminal Spirit the Ideas of those defective Parts, they shall beget Children maim'd in those parts. This is apparent from hence in the first part, that if the Parents were born maim'd in any part, when they have not been able afterwards to imagin any Ideas of the entireness of that part, as being that which they never knew perfect in themselves, frequently the Children are maim'd in that part. But if they were maim'd in any Member long after they were born, then easily and strongly imagining the Idea of that part of which they knew the soundness and the use before, they may supply that defect in the Seed and its Spirit.

How Idea's imagined are imprinted in the Seed.

XXXV. *But how the said Idea's are imprinted in the Seed by the Imagination of the Parent is not so easily explain'd. However thus it seems to happen. The Image of the thing often and seriously thought upon, is exactly delineated in the Brain; and that Picture and its bringing into Shape being imprinted in the Animal Spirits, and by them communicated also to the arterious Blood, together with these, that are to be the matter of the Seed, is carried to the Stones, and in the making of the Seed supplies therein the defect of those Ideas, which could not flow from the parts of which the Parent was destitute, and so the Seed with its enlivening Spirit, furnished with all the necessary Idea's of the several parts of the whole Body, acquires such an Aptitude that all the parts may be form'd out of it, even those Parts of which the Parent is destitute.* That this is thus done in the Seed, is no such Wonder, seeing that after the same manner sometimes the *Idea*'s of various things, are imprinted in the Birth already form'd through the strong Imagination of the Mother: Because that the Idea's of things imagined and exactly depainted in the Brain, being imprinted in the Animal Spirits, by the determination of the Spirits made by the Mind, or Will, together with the Arterious Blood flow to the womb, of which, and of the Birth therein contained the great bellied Woman often thinks; thence they are carried through the umbilical Vein to the Birth it self, which being very tender, by reason of the extraordinary softness of its Body, easily receives the Idea strongly imprinted into it by the Imagination of the Mother, (as an Image seen is imprinted into the soft Brain, to be shortly offered again to the Memory) which is very small at the Beginning, but increases more and more as the Child grows in the womb; as Letters or Pictures slightly engraven with a Penknife upon the Rinds of a Cucumber or Melon, grow by degrees with the Fruit. And thus also the Images of visible things, at a great Distance are depainted in the Tunicle of the Eye, by the help of the *Intermediate* Air, and Sounds are conveighed through the Air to Places remote.

Another Question to be answered.

XXXVI. Swammerdam *proposing this Doubt to me in his* Miracle of Nature, *How it comes to pass that Parents maim'd in some Parts, beget whole Children, as if he would with one Herculean Argument dilucidate the whole Obscurity, answers, because all the parts are contained in the Egg.* But if this be the true Cause, how comes it, that out of that one Egg, containing all the Parts, sometimes a Child happens to be born maim'd in some parts; and that sometimes when the Parents are sound and perfect in all their Limbs; and such, as before that, have begot, and afterwards also beget entire limb'd Children. Why should the Foundation of an Arm, or a Legg, or any other part be more wanting, in that Egg, than in the Eggs of other women, both before and afterwards conveighed to the womb, out of which entire Childeren have been conceived? If these women's Eggs contain all the parts of the birth in themselves, why does *Swammerdam* himself say, that *Levi*, long before he was born, lay in the Loyns of his Parents? Will he have also some Eggs to be generated in the Loyns of Men? 'Tis to be fear'd he will shortly bring 'em, as well out of the Heads as out of the Loyns of Men and the Stones of Women.

Whether Children can procreate.

XXXVII. *Here another Doubt arises; seeing that those spirituous Irradiations equally happen from all parts of the Body, in the Body of a Child, as well as of one grown to Ma-*

turity: Why the Office of Generation may not equally be perform'd as well by a Child as by a Perſon fully grown: When as the forming Spirit is equally preſent in both? I anſwer, this falls out for two Cauſes. 1. Becauſe that in a Child, that Spirit has not yet a Subject wherein to inhabit. For the Blood being very Oylie, is conſumed in the Growth and nouriſhment of the Body, ſo that there is no ſuperfluous blood out of which the ſeed can be duly made. 2. Becauſe that in a Child there are wanting thoſe requiſite Mediums to perfect that Work; For beſides the extream Oylineſs of the Matter, and its unaptneſs, the ſpermatic Veſſels are over weak to make Seed. In Males, the Yard is too ſhort, and the Paſſages are too narrow to conveigh the Seed out of the Stones to the ſeminary Veſſels, and thence to the *Vrethra*. In Females the Veſſels are two ſmall and ſtraitened, and the womb too narrow to receive the Seed.

Whence the likeneſs of Features

XXXVIII. *From what has been ſaid, perhaps ſome one may raiſe another Queſtion; ſeeing that the ſpirituous* Idea-bearing Irradiations *are to be conſidered only in the Seed of a Man, how it comes to paſs that the Birth does not always reſemble the Male parent in likeneſs of Feature and Form, but frequently the Mother?* *Hippocrates* of old gave ſundry Reaſons for this, taken from the various Quality and Quantity of the Seed of a Man and Woman mix'd together: Whoſe Opinion many follow, but do not explain it all alike. Among whom are *Capivaccius*, and *Deuſingius*, whoſe Opinions, becauſe they are grounded upon no ſolid Foundations, we ſhall omit for Brevities Sake. My Opinion is, that all this whole Matter depends upon the Imagination of the Mother. For a bigg-bellied Woman always thinking this or that when ſhe is awake, and converting her Thoughts for the moſt part to the Birth contained in the womb, if ſhe be an admirer of herſelf, and of the outward Shape and Form of her own Body, the Child will be like her. But if ſhe be a Perſon that is altogether taken with the Shape and Features of her Husband, and often imprint his Image into her Imagination, the Child will be like the Father. But that this Reſemblance does not proceed from the Quality or Quantity of the Seed of the Man and Woman, is hence apparent, for that a bigg-bellied Woman ſtrongly conceiving in her Imagination the external Features of any other Man, with whom ſhe never had any Familiarity, the Child ſhall be like to him: Nay, and many times, by beholding monſtrous Forms and Shapes, imprints and ſtamps 'em many times upon the Births. For wonderful is the Force of Imagination, eſpecially in Bigg-bellied Women; of which *Thomas Fienus* has written an excellent Tractate.

Thus far concerning the Mans Seed: Now particularly in a few words concerning the Seed of women, the uſe and neceſſity of it.

Of the womans Seed.

XXXIX. *Here preſently we meet a Queſtion, at the very Threſhold, whether Women have Seed or no?*

Whether Women have any Seed or no.

Ariſtotle affirms that women have no Seed; but that their Flowers ſupply the place of the Seed. For which they who follow this ſame Prince of Philoſophers, give theſe Reaſons. 1. Becauſe there is no way through which the Seed can paſs from the Stones to the Womb. 2. Becauſe the womans Seed can contribute nothing to Generation; and for that it has been found that Women have many times conceived without being ſenſible of any Pleaſure in Coition; and therefore without any emiſſion of Seed. 3. Becauſe the ſame Accidents do not befall women, at that time that Seed is ſaid to be generated in them, as happen to Men at that age, that is to ſay, their Voices do not change, their Nerves are not ſtronger, their Body is not dry'd, neither are they more perfect in the Gifts of the Mind, *&c.* 4. Becauſe by the Teſtimony of *Harvey*, the Teſticles of women in the Act of Generation do not ſwell, nor vary from their wonted Conſtitution either before or after Coition: Neither is there any ſign or mark of their Uſe or Neceſſity either in Coition or Generation. 5. Becauſe that by reaſon of the injection of the womans Seed into the womb in bigg-bellied women, frequent Abortion happens after Copulation. For that Seed muſt either be corrupted in the womb, and ſo bring various Miſchiefs, and at length Death upon the incloſed Birth; or elſe it muſt ſlip out of the womb, and ſo the Orifice of the womb being opened, Abortion muſt follow. And hence they conclude that women have no Seed, and ſo that their Stones are only given for Ornament, like the Paps of Men.

That Women have Seed.

XL. But this Opinion long ſuſpected, at length has been deſervedly rejected by moſt men; it being ſufficiently apparent that women have Seed from hence, that they have Stones, ſpermatic

tic Arteries, and Veins, and *deferent Vessels* as *Tubes*, and *Prostates*, which Parts not being given 'em in vain, no question serve for the Generation of Seed. Moreover in the Stones themselves the Eggs are conspicuously to be seen, containing a transparent White, well deserving the Name of Seed, which being matur'd, and bedew'd and impregnated with the male Seed, are conveighed through the *deferent Vessels* or *Tubes*, and so carried to the womb. *Lastly*, Women in Coition emit a certain seminal Matter out of the *Prostates* with great Pleasure, and after Coition suffer the same Symptomes as happen to Men, sadness, lassitude, conturbation in their Countenances, numness, and cessation from Desire. Thus both the *First* and *Second* Reason of the *Aristotelians* falls to the Ground. For that the Seed of women included in the Eggs, is altogether necessary for Generation is apparent from hence, that nothing is begot by the Male Seed, unless the Spirituous Part of it, light into the Liquor resembling the white of an Egg, as into the sole Matter proper for its use: And for that women never conceive, that have no Eggs in their Ovaries, as in elderly women; or at least none that are impregnated and carried out of their Ovaries to the womb: As neither do they Conceive who never emit with Pleasure any seminal Liquor out of their *Prostates*. And therefore there is no Credit to be given to those that cry they were ravished by Force, and conceived without Pleasure. *Lastly*, Because that among Brutes, Bitches, Sowes, and other female Creatures, being spay'd become Barren, as being depriv'd of the Organs generating *Seed-bearing Eggs*. To which we may add, that the Holy Scripture makes mention of the *Seed of the Woman*, as most necessary to Generation. The *Third* Reason of the *Aristotelians* is of no Value; For that at the time that Seed is generated, their Voices do not change, nor their Nerves grow stronger, *&c.* The Reason of that is, because the whole Temperament of their Bodies is much colder and moister than Mens; and therefore the Seed included in their Eggs, is much more crude and moist than the Seed of Man, nor does it diffuse such a hot and sharp Fermentaceous Expiration through the whole Body as a Mans Seed. No less vain is the *Fourth* Argument, for that the Constitution of the Stones was observed by *Harvey* not to vary either before or after Copulation, that was so imagin'd by *Harvey*, because that in a Beast killed before Copulation, he could neither discern nor know what was the difference of the Constitution in the Copulation itself; and in another killed after Copulation he could not find what was the Constitution in the Coition. For if perhaps the Stones did swell in Coition, the swelling of the Genital Parts most certainly fell through the terror of Death, and Death ensuing, and so return'd to their former lank Constitution; in like manner as a Mans Yard tho' stiff with Lust, flaggs upon the least Fear or apprehension of Death. Furthermore, neither in Coition nor after Coition does any manifest Difference outwardly appear to the Eye, neither in the Stones of Men or Women, only that they are drawn upward in Men, yet whether or no there happens any pleasing Alteration in the Stones of Females in the venereal Act when the Eggs are impregnated with the due of the Male Seed, this tho' Brute Animals cannot discover in Words, yet their Gesticulation sufficiently declares it: And therefore rational Women confess it, that they feel an extraordinary Pleasure in their Wombs, and all the adjacent parts; among which are the Stones, adhering to the Sides of the Womb.*

* *To these Reasons may be added one more, taken from Maids who have been seised with the* Furor Uterinus, *and have dyed of the same. In whom (being opened) the Testicles of one, or both, have been found extraordinarily swell'd beyond their natural bigness; and Authors report that some Pounds of the seminal Matter has been taken out of the Testicles of one who died of that Distemper. I have seen several who have had that Disease, of which two of them dyed by the force of the Malady. I desired them both to be opened, which was done. And in both, the Testicles were extreamly swell'd. In the first, the right Testicle as bigg as twice a mans Fist doubled, and being opened, there was near a Pint of seminal Matter which ran and was squeezed out of it. In the other, the right Testicle in like manner was tumified and as big again as the former, and as black as Soot, stinking extreamly, so that the Surgeon judged it a Gangreen.* Salmon.

The *Fifth* Argument proves nothing; for they who at the time of Ingravidation from the Eggs injected into the womb by Coition, are afraid of Dammage to the Birth and future Abortions, they are mistaken in that to think that in the Copulations of bigbellied women any Seed bearing Eggs fall anew into the Cavity of the womb, not knowing that those Passages, after Conception, remain clos'd up till the Delivery: As also the Vessels appointed for the Evacuation of the *Menstruum's*: And that that Pleasure, which such women are sensible of in Copulation, does not proceed from any Egg or Seed slipping out of the Stones into the womb, but from the Viscous Seminal Matter, which is squeez'd out of the *Prostates* into the *Uterine Vagina*.

Womens Testicles were made for absolute Necessity.

LX. *From what has been said it*

is sufficiently demonstrable, that Womens Stones were not given 'em only for Ornament, according to the Aristotelians, which can be none in a part that is always hidden and never conspicuous, but for absolute Necessity.

What this Necessity is.

XLII. *Now what that Necessity is, let us inquire: And therefore that something may be produced out of Plants, there is equally required both a Fertility of the Earth, and a fecundity of the Seed. The Fecundity of this Seed consists in the spirituous* Blossom; *the fertility of the Earth in a convenient Heat and Moisture, duly moistened and impregnated with Salt and sulphury Particles. Unless these two concur, nothing can be produced from the Seed of a Plant.* For Example, Let the best Wheat be thrown into a heap of Salt, Iron, Lead, or dry Sand, nothing grows from thence, tho' the Seed be fruitful in it self, because it does not light into convenient Matter, wherein the generative Principle may be dissolv'd and set at work. In like manner let the same Seed be cast into Earth where there is too great a quantity of Salt, Lime, Canker, or any such matter, endu'd with a corroding and sharp Quality, then the Seed is corrupted and extinguished, together with its generative Principle, and produces nothing; but if it be thrown into a fat Earth well dung'd, then the Heat assisting the more thin Particles of the terrene Moisture, enter the small Pores of the Seed, and are intermix'd with its Substance, which thereupon swells, and so the *Germen*, or generative Principle is dissolved and falls to work, and whatever is thence form'd is nourished, augmented, and increased by the same Moisture, melted and mix'd together with the thicker Particles of the Seed; being afterwards to receive from the Earth more and more solid Nourishment when once it has taken Root.

A Comparison between the Womb and the Earth.

XLIII. *And thus it is in the Generation of Man. The Womb is the Earth, first receiving the masculine fruitful Seed: But unless that Land be moistened with a convenient dewie Moisture, embrace and dissolve that received masculine Seed, and send forth its more subtle engendring Parts through the* Tubes *to the Eggs contained in the Stones or Ovaries, and that the Eggs thus impregnated proceed to the Womb, that through its cherishing Heat the generative Principle infused into 'em may fall to work; I say unless all this be, from the masculine Seed alone, tho' never so fruitful, there will be nothing generated: For nothing is generated from the Male Seed alone, tho' most fruitful in its self.* Now, that same Female Albuminous Seed of the Eggs is like the fat moisture of the Earth; nay it is the very fat prepared Moisture it self, which conveniently receiving the spirituous part of the Male Seed and entering its Pores, dissolves it, rowses the generative Principle latent therein, and excites it to Action. Which proceeding into Act, presently forms out of its self, in a small Compendium, the whole that is to be form'd, that is the first Delineations of the whole Birth, and nourishes it with that agreeable Albuminous Moisture upon which it swims first by Irroration and Apposition, till it be brought to such a Solidity, and that the Bowels are become so strong, that afterwards they may be able to make and prepare for themselves Nourishment carried to the Womb and infused through the Mouth and Navel.

Why a Woman does not conceive every time she is lain with.

XLIV. *Hence it is apparent why Copulation does not follow every time that a man lies with an Empty woman: because that if a woman, through any Distemper of the Ovaries, or their bad Structure, or by reason of her years, or through any other cause be destitute of Eggs, or that the albuminous Matter latent in the Eggs be badly temper'd, too sharp, too hot, too cold, or endu'd with any bad quality, and so be unfit for the dissolution of the Procreative Male Seed; then no Conception can happen, because the spiritous procreative Principle of the Male Seed, is for the same Reasons stifled and corrupted.* But this is not the only cause why Conception is hinder'd: for it frequently also happens, that the Eggs of Women are not come to their just Maturity, or through some Impediment of the Passages, the generative Principle cannot come to the Eggs, nor the Eggs to the Womb; or else the Male Seed being weak of its self, and destitute of a generative Principle, or for that its generative Principle is corrupted and suffocated in the Womb, before it can reach the Eggs, by reason

reaſon of the bad temper of the Womb, or elſe from the vitious Humours therein ſettled; for which Reaſons there can be no Conception.

The Male Seed is that without which there can be no Generation.

XLV. *However it be, the true, manifeſt, and neceſſary Uſe of the Male Seed appears from what has been already ſaid; as being that without which there can be no Generation of Man, no more than Generation of Plants, without a fruitful Moiſture of the Earth.*

Whether the Womans Seed be the cauſe of Formation.

XLVI. *Here a material Queſtion ariſes; If there be ſuch a neceſſity of the Female Seed, in reſpect of the diſſolving, cheriſhing, nouriſhing Matter, whether it have any ſhare in the forming the Birth?*

Hitherto it has been the common Opinion, That it has a ſhare as well of the forming Cauſe, as of being the nouriſhing Matter; and that it is mix'd with the Man's Seed, and that one Maſs is made of thoſe two Seeds mix'd together, and that out of that Maſs being fermented in the Womb, the ſpirituous procreative Principle is drawn forth, by which, and out of which, the Members of the Birth are delineated and form'd. Which Opinion *Sennertus* very ſpeciouſly both propounds and defends; and of which *Ludovicus Mercatus* is no leſs a ſtrenuous Patron, who thinks with one *Herculean* Argument to remove the whole Doubt, and to prove the forming Power of the Female Seed. *Whatever aſſimilates,* (ſaith he) *ſuffering with Victory, of neceſſity acts: but the Son is ſometimes made like the Mother; therefore the Mother acts in the Generation of the Son.*

It follows not that the Womans Seed affords any Power to form the Birth.

XLVII. *But tho' this whole Argument ſhould be granted, it does not follow that the Womans Seed affords any power to the forming of the Birth. For there is a great deal of difference between the* Mother acting, *and the* Seed of the Mother acting. For the Mother acts upon the Man's, and her own Seed, while ſhe warms, cheriſhes, and embraces both in her Womb, and ſo rowſes that ſame procreative Principle into Action. But this renders it fit for the Nutritive Matter. But neither She nor her Seed contribute any thing to the forming of the Parts, but as *Mediums*, by which the latent Power in Male Seed is ſet at work. But if the Womans Seed ſhould act in forming and delineating the Birth, then it ought to contain in it ſelf an active Principle of forming the Parts, which might be provoked from power to act out of that alone, by the cheriſhing of the *Uterine Heat*; but it has not, nor is any ſuch thing drawn forth out of it, as we have prov'd before, and is manifeſt in Wind-Eggs. The likeneſs of the Son to the Mother proves nothing, in regard the Cauſe of it does not proceed from any act of the Seed; but is imprinted from another Cauſe, for the moſt part upon the Birth it ſelf while it is forming, and oftentimes after it is form'd and furniſh'd with all its Members, and ſometimes ſome Weeks or Months after it is form'd: For that innumerable Examples of Big-belly'd Women teach us that the various ſtrong Imaginations of the Mother, and unuſual motions and determinations of the Spirits proceeding from thence, do wonderfully change the Birth already form'd, and imprint this or that figure upon it like ſoft Wax: while ſome affrighted by ſome terrible ſight, others looking upon Pictures, either with delight or abhorrency, others earneſtly longing for Cherries, or other Fruits, have imprinted ſtrange Forms and Moles upon the Birth, and that not long before Delivery; which active power nevertheleſs neither proceeds from the Seed of the Woman, nor can be any way attributed to her, the Action being done long after the forming of the Birth.

Three other more weighty Arguments.

XLVIII. *Beſides the ſaid Argument of* Mercatus, *there are three more ponderous produc'd by other Perſons:* 1. *Becauſe a Mule is generated between a Mare and an Aſs.* 2. *Becauſe that between a Man and a Beaſt, no Man but an irrational Creature is generated.* 3. *Becauſe a white Woman many times Conceives by an Ethiopian, and produces a white Infant.* Which things ſeem not to be done but by the forming power of the Female Seed, as it concurs with the forming power of the Male Seed.

The Male Seed does not proceed into Act unleſs there be a fit ferment mixed with it.

XLIX. *Before I diſſolve theſe Difficulties, I judge it reaſonable to conſider, that the Male Seed does not proceed into act; neither is there any thing produced out of it like to that from whence it proceeded, unleſs there be a convenient Ferment and Nouriſhment mixed with it; and if there be any Defect or Error, or Corruption in either, or in both, then either nothing, or ſomething Vicious,*

is

is produced out of it, which Nature perfects however as far as it can. In like manner as we see among Plants, that the Seed of *Barly* and *Wheat* thrown into barren Ground degenerates into *Darnel*, and other unprofitable Herbs, having no resemblance to the former, by reason of the Defect of convenient Ferment and Nourishment.

The Answer to the former Arguments. To the first Argument.

L. *This being premised, I come to the Objections, and answer to the first, that it does not prove that the female Seed concurs with the Masculine as the efficient Cause of Formation: But that in the said Case the active Principle of Generation is neither duly produced out of the Masculine Sex, nor conveniently proceeds into Action, by reason of the Impediments that occur, because that the Seed of the Ass is neither in the Egg conveniently enough dissolved and provoked into Act by the Seed of the Mare, proportionably to the Nature of that Creature; neither is there Nourishment sufficiently convenient afforded to it in the first Formation.* Hence the *Workwoman Nature*, who never is idle, when she cannot form and perfect an *Ass*, begets a Creature next approaching to the Nature of the *Ass*, that is to say a *Mule*, which in respect of the *Asses* forming Seed is by Nature an *Ass*, but in respect of the first Nutriment afforded in great Quantity by the *Mare*, and participating of the Nature of the *Mare*, causes a bulk of Body bigger than that of the *Ass*, and in some measure resembling that of the *Mare*.

Answer to the second Argument.

LI. *To the Second I say, That the same Defect happens to the Seed of the Man in the Womb and Eggs of the female Brute, and hence Nature instead of a human Birth, generates out of it an irrational Monster.* In like manner as in the Eggs and Wombs of women themselves, by reason of the same defect of convenient Ferment of the womans Seed, or some Corruption of that or the first Nourishment, instead of a Man, sometimes out of the fruitful male Seed Moles are generated, sometimes Brute Beasts, like Frogs, half Dogs, Dormice, Lizzards, and such like Monsters, of which there are several Examples to be found among Writers of Physical Observations, and among some Historians. Which Monsters however are not generated by the female Seed, as containing in it self any forming Power, but through the Defect of the female Seed, which being in a bad Condition causes that impediment, by which the forming Power of the male Seed is so disturbed and obstructed, that it cannot act aright.

Answer to the third Argument.

LII. *To the Third I say, That a white Woman may bring forth a white Infant, tho' got with Child by a Negro. Not through any forming Power in her Seed, but through her strong Imagination and Fancy of a white Child; and through the same strength of Imagination a Negro Woman may bring forth a white Infant.* Certainly the Imagination of women conceiving and with Child, works wonders, not only as to the forming of the Birth, but also after the Formation: And yet nothing of this can be ascrib'd to the actuating Power of the womans Seed.

Another Objection.

LIII. *Some there were who thought, that in the Mare before mentioned, and in other brute Animals, the Imagination strongly operates in the forming the Birth: Which others as strenuously deny;* And because brute Animals are void of Reason, therefore they will not allow 'em any Imagination, but if any thing unusual were begotten in the womb, they think it happened from the forming Power of the female Seed.

An Answer thereto.

LIV. *To these Arguments I answer, That tho' Brutes may be said to be void of Reason, Understanding, and Memory, yet they have something proportionable to it, as is manifest from their Actions (the Ox knows his Owner, and the Ass his Masters Crib: The Bee when she brings home her Hony, knows her own Apartment from a hundred that are like it; and a Dog understands the Commands of his Master, and does them.) And that there is something analogous to Imagination in Beasts Conceiving and bigg with Young, is apparent from the Story of* Jacob *. And I my self, with several others, saw a remarkable Example of this thing. In the Year 1626. there came by chance a *Dromedary* to *Montfort*, which the owner carried about to be shown. The Creature was very large, round and cleft Hoofs, very thick Knees, and swell'd to the bigness of a Mans Head. This *Dromedary* by chance

* Gen. 30.

chance, and out of the way, met a *Mare* which had been covered about two or three days before by a *Stonehorse*; which took such a Fright at the suddain meeting this Creature, that presently starting back she threw the Country Man that rid her; and when her time was out she foal'd a Colt, of which all the right Thigh before was like the Thigh of a *Dromedary*, with a large round Hoof and cleft, which Colt afterwards grew to be a strong Horse, which we saw afterwards for many years working both in the Plough and the Cart. Certainly no Man in his Wits will say that this Error in Shaping proceeded from any efficient forming Power in the Seed of the *Mare*, but rather from the strength of Imagination.

The Opinion of Consentinus *and* Deusingius *confuted.*

LV. Thomas Consentinus *fancied a quite contrary Opinion touching this Matter, for he writes, that as well the first Matter from whence, as the efficient Cause by which the Birth is form'd, lies wholly in the female Seed: But that the Mans Seed is neither the matter of the Seed to be form'd, neither contains the forming Power in it self; nor contributes any thing to Generation, but only a certain insensible Substance, which only kneads and moves the Matter brought by the Woman.* With him *Deusingius* agrees *Lib. de Genesi Microcosmi*, where he most plainly teaches, that the Birth is solely form'd out of the female Seed, and that it is not only the Matter out of which it is delineated, but that there is also in it a vegetable Soul that forms the Birth. But that it cannot be produc'd into Act, but by the assistance of the male Seed, as a kind of Ferment that dissolves its Substance, and so setting the latent Soul at Liberty, and provoking it to act. But this new Opinion is far remote from Truth while it attributes to the imperfect Seed of Women, questioned by some whether it deserve the Name of Seed, the whole power of forming, and the sole matter for the Form. For the Seed of a Tree, Wheat, Beans, or Pease, which is like the Seed of the Man, being cast into its Womb the Earth, does not dissolve the Seed or Juice of the Earth by its assisting Heat, and produce its like out of it; but is dissolved by it, and so the spirituous part of it being set at Liberty, and proceeding to Action forms out of it self the first Lineaments to be form'd, and nourishes and enlarges 'em when they are form'd, with the more thick Particles of it self (which seem to supply the place of the womans Seed) and then with the agreeable and convenient Juice of the Earth. The thing is apparent in a Pea or a Bean, which being laid in a warm and moist Place, do not themselves ferment the moist Air, that any thing should be generated out of it, but are dissolved by the Air, and so the spirituous part being set at Liberty, and falling to work, in themselves, and out of themselves, form the thing that is to be form'd, and cast forth the first Bud. So it is in the male Seed both of Men and Beasts, which being cast into the womb, and entring the Eggs with its fructifying part, does not within them produce any aptness in the womans Seed to form any thing out of it self, but its generative Principle being dissolv'd by the female Seed contain'd in the Eggs, containing the forming Power, is collected in a small Bubble, wherein being set at liberty, it forms out of it self what is to be form'd; and then the womans Seed included in the Egg, which first supplied the place of fermentaceous Juice, presently after serves for the first nourishment of the thing form'd. Moreover what *Deusingius* talks of the Seed of a Cock injected into the Ovarie of a Hen, that makes nothing against us: For that the smallest quantity of the Seed of a Cock is sufficient, for the first Lineaments of the Chicken to be form'd out of it. For if a human Birth, at the first laying its Foundations does not exceed the bigness of a *Pismire*, how much smaller and less, must the first Rudiments of a Chicken be, and how small a Portion of Seed will its first Delineation require? Nor is it true what *Deusingius* adds, that the Cock at one treading infertilizes the whole Ovary, and all the Eggs contained in it, nay that the very smallest Egg, some scarce so big as a Pea, are thereby infertiliz'd, tho' the Cock never tread Hen more. For the Seed of the Cock neither enters nor infertilizes other Eggs, than those that are come to a just Maturity. The rest that are small, and not ripe, are no more impregnated by the Seed of the Cock than a Girl of five or six Years can be impregnated by the Seed of a Man: For those crude and unripe Eggs are as yet not fit to admit and receive the Seed of the Cock, and therefore daily treading is required, to the end that those Eggs which every day grow ripe, may be impregnated by the Seed of the Cock. And hence it is that those Hens

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that are seldom trod, lay many wind Eggs that come to nothing. And therefore it is that they who desire many Chickens, choose out the Eggs of such Hens as were most frequently trod by a brisk Cock. The same Consideration may extend it self to womens Eggs, which so long as they are unripe, will not admit the generative Principle of the male Seed, which is the reason that many young Women of cold Constitutions, do not conceive in several Months after they are married, because their Eggs are unripe and unfit to receive the generative part of mans Seed, which afterwards they do when they come to full Maturity.

The Opinion of Swammerdam *refuted.*

LVI. Swammerdam *also seems to ascribe both the Matter and the forming Spirit to the Seed of the woman. Fecundation or Conception,* saith he, *is nothing else, but a Communication of more perfect Motion. So that the Egg, which was nourished and laid in the Ovary, after Conception, the Ovary being left, may live and be nourished after a more perfect manner, that it may be thought to look after and maintain it self.* And in another place he says, *all the Parts are in the Egg.* And assuming to himself the Opinion of *Consentinus* and *Deusingius*, he asserts that the Seed of man contributes nothing to Fecundity, and that neither the Matter out of which the first Delineation is made, nor that forming Spirit is in it. But if he bring not stronger Reasons than that of *may be thought*; certainly his Argument will be too weak to confirm his Opinion, or refute mine already proposed concerning the Seed of Man. And indeed how mistrustful he is of his own Opinion, he shews ye in these Words of his, *Fecundation cannot be demonstrated but by Reasoning, and very difficultly by Experience.*

Whether the Seed of women be a Matter necessary for Generation.

LVII. *These and the like Considerations are the Reasons that the aforesaid Opinion of the forming Power of womans Seed has been disliked by many famous Men, who therefore judged that the womans Seed concurr'd in Generation as a matter necessary to receive the procreative Part of the female Seed to cherish and give it Liberty, and set it at work; and to nourish the Embryo first delineated, but contributes no Matter to the forming of the Lineaments, nor can claim any thing of efficient Cause in forming the Birth.* Which latter was the Opinion of *Aristotle*, stiffly afterwards defended by *Cæsar* of *Cremona*, as also by *Scaliger*, in these words. *As there can be but one form of one thing, so the Principle containing that Form can be but one. Therefore the Seed of Man is but one. For being simple and indivisible in its Form, it cannot be composed of two, which it would be if it should proceed from the Male and the Female. Subtil. Exercit.* 268. Several other Arguments he adds in the same place, by which he does not only deny all forming Power in the female Seed, but refuses to acknowledg the Seed it self; nor will he seem to allow it any ministerial Function. *Scaliger*'s Arguments are very weighty; so that I easily agree with him, that the form and act of Formation proceeds only from the Seed of the Man, and that the womans Seed contributes no forming effective Cause to the shaping and delineation of the Birth. Yet I cannot with *Scaliger* wholly renounce the womans Seed; for I have both asserted and prov'd it to be very necessary for Generation. And being necessary, yet not having a forming Power, it cannot otherwise be necessary but only in respect of that Matter, without which the Power of the mans Seed cannot be waken'd and rowsed into Act. Now that it is not endu'd with a forming Power, appears from hence, that a woman cannot conceive of herself without the help of male Copulation. Tho' it may be very probable that in her nocturnal Pollutions, which happen to women as well as men, besides the seminal Matter breaking forth out of the *Prostates* into the *Vagina*, many times the Eggs slip out and evacuate through the *Tubes* into the *Womb*. Which nevertheless, if the Seed included in the Eggs contained two Principles of Generation, Active and Passive, seeing she has both Place, Time, and Nourishment convenient within her own Body, could not choose but conceive of herself. Besides, Nature has so provided, that there shall be only one Agent to produce a natural Effect, by the Testimony of *Aristotle*; but if the Seed of the woman participated of the formal and efficient Cause, then there would be two active Principles, the Seed of the woman, and the Seed of the man, which is repugnant to the Order of Nature. Again, if both Sexes contributed an active Power, the Male would produce either

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the same with the Woman, or another quite contrary: If the same, then one would superabound; if different, then Twins would always be begot, or *Hermaphrodites*, which rarely happens. *Lastly*, our Opinion is confirm'd by the Natural Instinct of Mankind; for the Children are not denominated from the Mother, but generally from the Father, as from him, who being their Efficient Principle, contributed to their being form'd.

The Seed of the Woman contains in it self no forming power.

LVIII. *Hence it is apparent that the Seed of the Woman does not contain in it self any forming Power in reference to the Birth, nor is any Efficient Cause thereof; nor as the first matter, contributes to the first matter of the Birth that is to be form'd:* but that it is only necessary as a matter gently receiving the generative Principle of the Male Seed, dissolving and fomenting it, and setting at liberty the forming spirit inherent in the generative Principle; and disposing it to act, and to form all the first Lineaments of the Body out of it self, and nourishing the *Embryo*, when reduced into shape.

The Opinion of Hippocrates.

LIX. Hippocrates *does not seem to favour this Opinion of ours, who writes thus*, Lib. 1. de Genitur. *In Man there is both the Male and Female Seed; and so likewise it is in Woman; but the Male Seed is the stronger: and Generation must of necessity be accomplish'd by the stronger.* In which words *Hippocrates* seems to intimate, that Womens seed partakes no less of the Efficient Cause than the Man's. I answer, That in Generation, the strength of the Seeds consists partly in the Efficient Cause, partly in the Material preparing for Formation. And both Causes being taken separately, may be called either strong or weak, or to use *Hippocrates*'s phrase, either *Virile* or *Female*. When the Efficient Cause of Formation, which is in the Male Seed, is strong or virile, and the material, cherishing, and nourishing Cause, which is the Female Seed, is likewise strong or virile, then of both together comes a Male Child. If either Cause be weak, yet one stronger than the other, then from the Cause that prevails proceeds a Boy or a Girl. So that it cannot be concluded from the words of *Hippocrates* himself, that he allowed the Female Seed an Efficient Power; but that he has plac'd that same strength of which he speaks, no less in the Material *preparing* Cause than in the *Efficient*, and that by *strength* in the Male Seed he understood a strong and robust efficient Power of Forming; in the Womans Seed, an excellent temper of preparing and nourishing Matter, and an aptitude to set at liberty the efficient principle latent in the Virile Seed.

The Opinion of Vesslingius.

LX. Vesslingius *fancied quite another Opinion of the Womans Seed; for he acknowledges therein a double substance; one Corporeal, requisite for the forming of the Birth, and another more watery, which loosens the parts of the Womb, cherishes and preserves the Birth, and which he says, flows continually into the Womb after Conception.*

The Portion, saith he, *of Spermatic Moisture, which flows from the Stones to the bottom of the Womb, is of a more noble use after Conception. For upon this swims the rude little Body of the Embryo, at the beginning of its conformation; and so not only hinders the more intense heat of the Womb from making any irregular dissolution of any thing, but gently sustains the Birth it self in the strong shogs of the Mothers Body, and secures the Umbilical Vessels, at that time as thin as a hair, from danger of a Rupture.*

Vesslingius has done well to consider two parts in the Seed of the Woman: but in that he was greatly deceived according to the ancient Opinion, that the Man and the Womans Seed were mix'd together in the Womb, and so thought the Birth to be form'd out of that Mixture; and that he also believed, that the Milky Juice, which in Big-bellied Women flows to the Womb for the nourishment of the Child, to be the more watery part of the Womans Seed. Concerning which Juice, see *Chap.* 31.

Harvey's *Opinion.*

LXI. *At this day, according to the Opinion of* Harvey, *many people assert, that the Womens Seed, after Conception, together with the Man's Seed, flows out again from the Womb, as being altogether of no use. Yet tho' the vanity of that Opinion be apparent from what has been said, we shall examin it however more at large in the next Chapter.*

After this Explanation made, both of the Man's and Womans Seed, two things remain to be inquired into in general concerning the Seed. *First*, At what Age the Seed is generated; and *Secondly*, Why Eunuchs and gelt Animals become fatter and more languid?

At what Age the Seed is generated.

LXII. *As to the first, The Seed is not generated till the habit of the Body becomes dryer and stronger, and when the Body is come to its full growth. And hence it is, that because the Body attains that strength and firmness between the fourteenth and twentieth year, that then the Seed begins to be generated, and acquires every day so much the greater perfection, by how much the Body grows stronger, and needs less growth.* Now the reason why Seed is not generated at younger years, and in Childhood, is vulgarly imputed to the growth of the Body, upon which the superfluous part of the Blood, of which the Seed is hereafter to be made, is then consumed. But this Reason is far fetch'd, and only a sign of the Cause why Seed is not generated. First therefore we are to enquire, why at younger years the Body most increases in bulk, and grows so fast, that by the knowledge of this we may come to know why the Seed is not generated at that Age.

The growth of the Body, whence.

LXIII. *The growth of the Body proceeds from hence, because all the Parts abound with a moist, sulphurous, oily Juice, and for that reason are very flexible and apt to extend; so that the Animal Spirits flowing into them, the Blood pour'd into the Arteries for Nourishment sake, do not so sharply ferment, and therefore cannot make a sufficient separation of the salt Particles from the sulphury. Partly because their force is debilitated by the copious Moisture, and oilineſs of the sulphury parts. Partly because the Brain it self, being as yet very much over moist, does not at that time breed such sharp Humours, as to make a smart Effervescency, which afterwards come to be generated in greater quantity when all the parts come to be drier.* For this Reason also the Spermatic Vessels, where the chief strength of Seminification lies, are not then so very much dryed, but by reason of the copious more moist and oily Particles of the Nourishment, continually poured in upon them, they are extended, and grow in length and thickness: and that so much the more swiftly, by how much more moist and oily Nourishment feeds them, as it happens in Infancy and Childhood. But their strength and solidity is then more increased when they become dryer and grow less. I speak of moderate and convenient drineſs, not of a total consumption of moisture. Now the reason why they become more dry is, because the overmuch oily Moisture is by degrees consum'd by the increasing heat, and by that means the overmuch moisture and lankness of the Spermatic Parts is abated, and they become stronger, in regard a greater quantity of the salt Particles separated from the Blood, is mingled with them, and is more firmly united and assimilated to them.

Why Children do not generate Seed.

LXIV. *The same cause that promotes and cherishes the growth of the Body, hinders the Generation of Seed in Children. Hence it is that the Blood is more moist and oily; and the Animal Spirits themselves less sharp, and fewer in quantity, flow to the Stones, so that there is only enough for the growth of the Parts, but not for the Generation of Seed.* But afterwards, through the increase of heat that oily superfluous substance being somewhat wasted, then the Brain being dryer begets sharper Animal Spirits, which being mix'd with the Arterious Blood, carried through the Nerves to the Stones, more easily separate from it the salter Particles more fit for the Generation of Seed, with which being condens'd and mix'd into a thin Liquor by the proper quality of the Stones proceeding from their peculiar structure and temper, they are concocted into Seed, which becomes so much the more perfect, by how much the copious Moisture is predominant therein, which in perfect Seed ought to be but moderate.

Why old men do not generate Seed.

LXV. *And hence it is also apparent wherefore in old Age, very little, or watery, or no Seed at all is made in the Stones: Because that by reason of their abated heat, over much moisture again prevails at that Age through the whole Body; tho' not so oily as in Childhood, but crude and more watery, whence the Brain becomes moister, and begets fewer or less eager Spirits, and the Blood becomes colder and moister.* Moreover, the Parts themselves concocting the Seed, become more languid and over moist, and consequently unapt, as well in respect of the Matter, as their own proper debility, to make Seed: I except some sort of old men, vigorous in their old Age, who at fourscore and fourscore and ten have begot Children,

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as *Platerus* relates concerning his own Father.

Why gelded Animals grow fat.

LXVI. *As to the latter Question, why Eunuchs and gelded Animals become more languid and less vigorous, the Reason is, because that through the cutting out of the Stones, there follows an extraordinary change of the whole Temper of the Body; in regard that lustful seminal Breathing ceases, which is diffus'd over all the Parts of the Body (which is apparent from the peculiar Smell and Rankness of Tast in the Flesh of Beasts ungelt) and by means of which the Blood and other Humours are more warmly heated, and the Spirits rendered more smart and vigorous.* This remarkable Alteration of Temperament is apparent in Eunuchs from hence, that the Hair grown before Castration never falls off, and the Hair not grown before, either upon the Lips or other parts, never comes: Quite contrary to what befalls those that are not gelt.

An Observation in gelt Deer.

LXVII. *The same is manifestly observed in Deer, who shed their large Beams every Year, and then new ones come the next Year in their places; but being gelt presently after they have shed their Horns, their Antlers never grow again, but they become very fat.* Now this change of Temper, caused by the defect of lustful and masculine seminal inward Breathings thorough the whole Body, tends toward Cold, whence it happens that the Blood becomes more oily and less fervent, and the animal Spirits are generated less sharp and vigorous, and less dispers'd, and that part of the Blood, which otherwise ought to be consum'd in Seed and seminal Spirits, remains solely in the Body; fills the Vessels, and more plentifully nourishes every part; and that plenty and oyliness of the Blood moistens and plumps up the Body to a more extraordinary Corpulency. For the fermenting Quality of the animal Spirits in such an abounding Quantity of sanguineous Juice, tho' less fervent, being now more languid and remiss, becomes less able to separate the sulphury and oily Particles of the Blood from the salt ones, which for that reason remaining mix'd together in greater quantity, and joyn'd together for the nourishment of the Parts, moisten them less, and render them fatter, but more languid, and not so strong. For that Interposition hinders the more dry and salter Particles of the Blood from being firmly united to the spermatic Vessels.

In gelt Persons or Beasts, the Spirits become less sharp and subtle, and so less fit for animal Actions.

LXVIII. *To this we may add, that in those that are gelt, by reason of that extraordinary Redundancy of oylie Blood, the Brain it self is overmuch moistened, whence the Spirits become less sharp, subtil and vigorous, and consequently less sharp and fit for animal Actions.* Which make *Eunuchs* more dull, less couragious, languid, and effeminate, and slower in all the Exercises both of Body and Mind.

Why fat People less fit for Venery.

LXIX. *From the same Redundancy in the Blood of oily Particles, dulling the Acrimony of the animal Spirits, it happens, that they who are naturally fat and gross, generate less Seed and slower, are less fit for the Sports of* Venus, *and are soon tired.* Whereas on the other side strong lean People are prone to Venery, and hold out longer. Because they have more Seed, and more quickly repleniish'd, besides that their animal Spirits are sharper and more copious; and their fermenting Power is not so soon abated by the over much Plenty of Oily Moisture. But some will say, why are not Children fat for the same Reason? Because the redundant moist and dew-like Blood is consum'd in the growth and increase of the Body.

Why in a Plethory the Body becomes unweildy, weak, slothful, drowsy, sleepy, &c.

LXX. *From what has been said it appears, wherefore in a Plethory the Body becomes unwieldy, slothful, and weak, and all the animal Actions, both the principal, and others grow drowsy, and the Persons themselves are sleepy and heavy Headed,* &c. because that by reason of the extraordinary Redundancy of the oylie Particles in the Blood, the animal Spirits are generated fewer in Quantity, less sharp and active.

Now what that fermenting Power of the animal Spirits, so often mentioned, is, see *l.* 3. *c.* 11.

CHAP. XXIX.

Of Conception, and the forming of the Embryo.

Conception. I. *When the fruitful Seed of both Sexes is received into a Womb well dispos'd, and is detain'd inclos'd therein, it is called Conception.*

Where it is made. II. *This Conception is made in the Cavity of the Womb it self, and not in any Pores of the inner Membranes; in regard that no Quantity of injected Seed can be contain'd in the Pores, neither is the prolific Principle, being separated from the thicker Mass of the Seed, included in the Pores, but is carried through the Tubes to the Ovary; with which the Eggs being impregnated, pass the same way to the Womb, where they are detain'd and cherished.* But as for those, who following *Harvey*, assert that the Seed being injected into the Womb, soon after flows out again, the prolific Principle only remaining within, and tell us that the Conception is perfected not in the Cavity of the Womb, but in the Pores of the internal Membranes, which *Regius* also affirms: how far they are mistaken shall appear by that which follows.

The Orifice of the Womb must be clôsed after Conception. III. *Now it is necessary, that the Seed being receiv'd and detain'd, that the Orifice of the Womb should be closed, and so continue; at least for the first Months, to the end that Spirit, wherein the fruitfulness of the Seed continues, should not be dissipated and lost, before it slide through the Tubes to the Ovaries; which would easily happen, were not the Orifice well closed; that the Eggs also being impregnated with the said Spirit, and so carried from the Ovaries to the Womb, should not slip forth, nor be corrupted by the entrance of the Air.* This Closure of the Womb, as *Galen* affirms, and we have seen, is so strait and exact that it will not admit the top of a Probe.

Whether the Seed of both Sexes concurs. IV. *Now I speak of the Seed of both Sexes, neither will I be so rash, as with* Aristotle, *or with* Harvey, *to question the Womans Seed, or to believe that Conception cannot be made without it, having prov'd the necessity of it in the former Chapter*; for tho' it be not the efficient Cause of Formation, yet is it such a material Cause, as ought necessarily to concur in the Eggs with the prolific Principle of the male Seed to its Dissolution, and the Expedition of its Operation; and it also constitutes the Matter, together with the more watery dissolv'd Parts of the masculine Seed, by which the most slender, the most tender and smallest Threads of the Members of the *Embryo* being by this time form'd, may first be cherished, and then receive its Nourishment from it, as likewise its Growth; as also for the forming of the Membrane it self, the *Amnion*, and the *Chorion*; in like manner as in a Hens Egg we see the Shell, and the inner thin Membrane form'd out of the Seed of the Hen, before her being trod by the Cock; as is apparent in Wind Eggs. Which Shell however, together with the foresaid thin Membrane in the Eggs of Hens and other Birds, neither grow nor are enlarged after the Eggs are laid, because they have acquired their just Capaciousness and Magnitude before the Eggs were laid; as being to be hatch'd without the Body of the Birds, quite otherwise than in other Creatures that bring forth live Conceptions, in which, as the *Embryo* grows, those Membranes must of necessity encrease. And hence because the womans Seed alone is not sufficient to supply that daily Growth in the Womb: First the more watery Parts of the male Seed residing in the Womb, and the Blood and other Humours conveighed through the *Vasa Sanguifera*, joyn themselves to its assistance.

Aristotle's Opinion about the menstruous Blood exploded. V. *Here we think fit to explode the Opinion of those who with* Aristotle *say that the menstruous Blood concurs in like manner with the Seed to the first forming of the Parts.* For all the Parts are delineated out of the Seed alone, and that by and out of the most subtil and most spirituous part of it: Neither does the menstruous Blood, nor any other Blood contribute any thing more than Nourishment, which causes the Growth of the Parts.

The detension of the Seed. VI. *After Conception the Orifice of the Womb is not only closed, but the whole Womb contracts it self about the*

the Seed, to the end it may the better detain and embrace it. Thus *Galen* reports that the Women have often told him, that after Conception they have felt a certain motion in the Privities, that did as it were pull and contract them together.

The Colliquation of the Seed.

VII. *The Seed being detain'd in the Womb, is cherish'd, alter'd, and melted by the dewie heat of the Womb; and so its thicker and more fix'd Particles, being dissolv'd by a more firm cleaving and binding together, the more spirituous and active parts which lay imprison'd in those thicker Particles being set at liberty, presently pass through the Uterine Tubes to the Ovaries, to the end they may enter the Eggs that are come to maturity, and impregnate them, wherein they meet in a small Bubble, and like a transparent and crystalline Liquor appear in the Egg carried to the Womb.*

In the small Bubble only is the forming of the Embryo.

VIII. *Now in this small Bubble only is the forming of the whole Embryo perfected. For in that same thin and spirituous part of the Seed the Architectonic Faculty lies, which by the cherishing of the Uterine heat, together with its subject in which it is fix'd, that is to say, that same thin and spirituous Liquor of the Seed, being set at liberty breaks forth into Action.* For it cannot be free, but it must act: nor can it be set at liberty, unless by an External Cause; that is, by the heat of the Womb, the whole Mass of the Masculine Seed being ejected in Copulation, be dissolv'd and melted, and by that means the spirituous or prolific Part being separated from it, be carried through the *Tubes* to the Ovaries, and then shut up in the Eggs, return again with them to the Womb. For as nothing can produce it self, so neither can any form produce it self out of Matter. But breaking forth into Act out of its slender inclosure, it begins the delineation of the whole *Embryo*, and in a short time compleats it. For presently the thin Particles of the Bubble are gently agitated, and mov'd one among another, and coagulated here and there into various forms and shapes, and innumerable passages are hollow'd out through them, and so all the Parts of the Body are form'd: because that same spirituous Matter of the Bubble being separated from the thicker Mass, contains in it self Idea's of all the Parts, and hence acquires an aptitude to receive the forms of all the Parts, and shape the Figures in it self. Now because there is but a very small quantity of that spirituous part included in the Bubble, and still the least and most subtil part of that is expended upon the Delineation of the *Embryo*, therefore the Birth at the beginning is scarcely so big as an Emmet.

Delineation performed solely by the Seed.

IX. *Hence it is apparent, because the Liquor contain'd in that Bubble is the most subtil part of the Masculine Seed, that the first delineaments of all the Parts are form'd out of the Seed alone, that is, out of the most thin and subtil part of it, and then is afterwards increas'd, and more embody'd, first by the thicker Particles both of the Man and Womans Seed melted and diffus'd, and then by the milkie watery Juice flowing through the Navel.*

Aristotle's Errour in affirming that all the parts are form'd not out of the Seed, but out of the Blood.

X. *From what has been said, it is manifest how much* Aristotle *swerv'd from the Truth, while he affirms that all the Parts are form'd, not out of the Seed, but out of the Blood: nay, while he attributes to the Male Seed no share, either as to the Formation or the Matter; but only affirms that the menstruous Blood by motion generates both form and parts. The Seed,* says he, *is no part of the Embryo, as the Carpenter contributes nothing to the matter of the Wood; neither is there any part of the Carpenters Art in what is fram'd, but form and species proceeds from that by motion in the matter.* In which Error *Harvey* also fell, while he endeavour'd to prove that the Blood exists before all the other Members; and hence all the first threads of all the parts are delineated out of the Blood; which he would seem to confirm more strenuously *Exercit.* 56. *It seems a Paradox,* says he, *that the Blood should be made and imbued with vital Spirit, before the Blood-making or moving Organs are in being.* Thus *Exercit.* 16. he says, *that the Blood is first in being, and that Pulsation comes afterward.* But we answer to *Harvey*, That tho' the little Heart, which sanguifies, cannot be well discern'd at first, or clearly be distinguish'd from other parts; yet of necessity it must be form'd, together with the rest of the parts, before the Blood, and being form'd presently beats; tho' the slender Pulse cannot be discerned by us at the beginning. For all the Parts delineated out of the pellucid, spirituous, seminal

Liquor

Liquor inclos'd in the Bubble; and ſo by reaſon of their colour, and their extream ſmallneſs are hardly to be diſtinguiſh'd by the ſight. For otherwiſe, that there is a heart, and that it exiſts before the Blood, the Effect manifeſtly declares. For ſeeing there is no Blood contained in the Bubble before delineation, nor can flow into it from any other part; therefore that which is obſerv'd in it at the beginning of the delineation, when any ſmall Threads begin to appear, muſt of neceſſity be generated within it; now then if no other part generate blood but the heart, nor any blood can be generated ſpontaneouſly, and by it ſelf, of neceſſity when any ſigns of blood begin to appear in the Liquefaction of the Bubble, which are eaſily viſible, becauſe of their ruddy colour, we muſt of neceſſity conclude a præexiſtency of the Efficient Cauſe of blood, which is the heart, tho' it cannot be ſo eaſily diſcern'd or known to be what it is, by reaſon of its tranſparency and exility. So likewiſe if the blood be moved through the Veſſels, ſince it cannot be done without pulſation of the heart, moſt certain it is that the heart beats, tho' the pulſation be not to be diſcer'nd. For the reaſon why neither the little heart, nor its pulſation, cannot be diſcer'nd, is not becauſe there are no ſuch things, but becauſe they are ſo extreamly ſmall, as not to be diſcernable to our eyes. Moreover, the thing is manifeſt in an Egg put under a Hen; for the colliquation with the Bubble that firſt appears to the Eye, is before the blood: and ſince it includes in its Bubble the forming power that makes the Chicken, and for that the blood can never penetrate the inner parts of the Egg, it is an Argument that the Members of the Chicken delineated, are delineated out of the Bubble of that Colliquation, and not out of the blood. And thus a Plant is not generated out of the green Juice, with which it is afterwards nouriſh'd, but out of the ſpirituous prolific Principle latent in the Seed. But when the Plant is generated, then it goes on with its work in preparing the Juice which it makes for its Nouriſhment. To this we may add, That it appears by inſpection into a Hen Egg, that a ſmall leaping print and the blood are ſeen together.

There can be no blood before the Organ that makes the blood is form'd.

XI. *Whence it is apparent that there can be no Blood, before the Organ that makes the Blood, that is the heart; which if the delineaments of the whole Body were form'd out of the Blood, ought to be form'd with the reſt after the Blood, which is falſe, as we find by the teſtimony of our own eyes, and which the Reaſons before alledged confirm.* And therefore the firſt Threads of the Infant are delineated out of the Seed alone, and not out of the blood; neither does the Architectonic Spirit bring forth into Action, out of the Blood, but out of the prolific Principle, and the ſanguific Bowel the heart being form'd, preſently that begets the blood, and puts it into motion. *Deuſingius* diſcourſing of this matter, thus breaks out; *What Captain,* (ſays he) *or what Intelligence directs the blood through the vagous and floating matter of Conception? What aſſiſting Intelligence* (*when firſt it is deſtitute of underſtanding*) *ſhall deſign for it the ſeat for the forming the Bowels? Where is the heart to be form'd? where the Reins to be plac'd? where the Brains or the Spleen? leſt the Brains ſhould chooſe their ſeat in the* Abdomen, *and the Inteſtines theirs in the Scull? What Cauſe ſhall move it to a Circulation afterwards, unleſs it were mov'd by the beating Veſicle of the heart? What Providence ſhall ſo reſtrain its wandring at firſt without any Receptacles, and upon the building of the ſeveral Conduit-pipes, ſhall direct its courſe into each of them.*

It is a peculiar and appropriated nouriſhment that is requiſite for the Embryo.

XII. *Now it is not any ſort, but a particular and appropriated Nouriſhment that is requiſite for the ſmall Body of the* Embryo, *already delineated in the Bubble, by which, without the viſible concoction of the Bowels, it may be cheriſh'd and enlarg'd.* Now this Nouriſhment could neither be Blood nor Chylus, as wanting a greater preparation and concoction before they can nouriſh; and therefore for that purpoſe the provident Creator has included Female Seed in the Womans Egg, like a certain white of a Hen Egg, as being a moſt mild Humour, moſt apt for the firſt cheriſhing and moiſtning Nouriſhment of the ſwimming *Embryo*, neareſt approaching to the nature of the tender parts already delineated, nor having need of much concoction, but only a ſlight preparation, and a gentle colliquation and attenuation, through the mild heat of the Womb. Thus alſo *Galen* writes, That the *Embryo* is firſt nouriſh'd by the Female Seed, as being that which is more familiar to its nature than the blood; ſince every thing that is nouriſh'd muſt be nouriſh'd by its like. As we find that Chickens are firſt nouriſh'd in the Eggs with the inner white, which

which is the Seed of the Birds. But in regard that in the little Egg, which in women falls out of the *Ovarie* through the *Tubes* into the Womb, there cannot be much female Seed contain'd, therefore there is added to it a watery Juice, being the remainder of the Mans Seed already melted and attenuated, after the prolific Principle being separated from it, and driven to the Ovaries, which the Egg falling down into the Womb, gentlely receives and embraces, and penetrating the Pores of its little Stems, and by that means entring the inner parts, and mingling it self with the albumineous female Juice, encreases in quantity the Colliquation where the *Embryo* swims, and also strongly distends and amplifies the little Skins of the Egg, that there may be a larger Seat for the *Embryo*, and more Nourishment, next approaching the Nature of its Principles. But whether that seminal Liquor, which flows from the *Prostates* of women in Copulation, be mix'd with the residue of the mans Seed in the Womb, or presently flow forth after the Act, I cannot hitherto certainly find out. Besides the prolific Principle before inclosed in the Egg goes to work much more strongly and vigorously, when the thicker dissolv'd part of the mans Seed has entered thorough its Tunicles into the inner parts of it; and by mixture of it self has conveniently dissolv'd the albumineous female Seed, to make it more fit to rowle the Spirit of the prolific Principle into Act. The same appears also in Plants, in whose Seed the prolific Principle being included and intangled, never proceeds into Act, till they have suck'd in the Juice of the Earth through their Husks and Shells, which dissolves the inner Substance that resembles the womans Seed, and so sets the prolific Principle at Liberty to fall to work: And so the first Cherishing and Nourishment of the *Embryo*, is like that Substance, out of which it is form'd, or at least form'd out of the like. Which is observ'd also by *Aristotle*, who says, *The Matter is the same that constitutes and enlarges the Creature.* For whatever is added to the delineated Parts while they grow, ought to be like that Substance, out of which they were fram'd. In which Particular *Harvey* also agrees.

How the residue of the mans Seed enters the Bubble.

XIII. *Nor let any body wonder, that the remainder of the masculine Seed dissolved and attenuated, should penetrate and enter the inner Parts of the Egg, through the Pores of the little Skins of the womans Egg (which Skins are very tender and porous at first, but composing the* Chorion *and* Amnion *so close and firm, that they will suffer the Penetration of no Humour.)* For this Penetration may as well happen in a womans Egg, as in the Seeds of Plants, that through the Pores of their hard Shells easily imbibe the Moisture of the Earth, by which the Rind is then very much dilated, which causes the Seeds to swell, and with that imbib'd Moisture of the Earth mixed with the thicker dissolv'd Particles of the Seed, the delineated Kernel so soon as shaped is nourished; which being brought to that bigness as to want more Nourishment, that cast forth Roots like Navils, to draw out of the Earth a stronger Nourishment through them. And thus it is a in human *Embryo*, and the dissolv'd remainder of the mans Seed mix'd therewith. But this Nourishment being almost spent, the Womb begins to enlarge it self, for the Passage, thorough it, of the Nourishment to the *Embryo*, as through a Root.

A twofold manner of Nourishment.

XIV. *This foresaid Matter, nourishes the Parts two ways. First by a close Apposition; as the tender delineated Parts are every way moisten'd and increased by it. Secondly, By the Assimilation of the Aliments concocted in their proper Bowels. For that the newly form'd Bowels of the* Embryo, *at first cannot undertake Concoctions, nor prepare or make Nourishment, which is the reason that the thin Nourishment is afforded by Apposition out of the seminal Matter prepared before. But soon after the Heart makes Blood of the same Matter, for the more plentiful intrinsic Nourishment of the Parts, and then to the Nourishment by Application, is added another Nourishment by Reception.*

Both these ways at the Beginning *Harvey* acknowledges, *Exercit. 9. For*, says he, *in all Nutrition and growing there is equally necessary a near Application of the Parts, and Concoction and Distribution of the apply'd Nourishment, neither is the one to be accompted less true Nourishment than the other, seeing that it happens by the Access, Apposition, Aglutination, and Transmutation of new Nourishment. Neither are Pease or Beans said less to be nourished with the Humor*

of

of the Earth, which they ſuck in through their Tunicles, like Spunges, then if they ſhould admit the ſame Nouriſhment thorough the Orifices of little Veins, &c.

But at length that ſeminal Liquor being ſpent, and the Bowels being by this time well grown and corroborated, and the milkie Juice flowing copiouſly into the *Amnion*, the Nouriſhment by Application ceaſes by degrees, and Nouriſhment by inward Reception, that is, by the Blood takes place. Becauſe that milkie Liquor is not ſo agreeable to the parts of the Birth, as the firſt ſeminal Liquor, and therefore requires a more perfect Concoction and Alteration into Blood before it can nouriſh.

The Blood bred in the Heart cleaves to the ſmall Fibres of the Parts: Firſt of the Heart, then of the Liver, Lungs, Kidneys, Stomach, Muſcles, &c.

XV. *But the Blood being bred in the Heart, and imparted to the whole Body, cleaves to the ſmall Threads of the Parts, firſt of the Heart, then of the Liver, Lungs, Kidneys, Stomach, and Muſcles*, &c. For there are various thicker Particles in the Blood, thin, ſalt, ſulphury, mix'd, of which ſome cleave to and are more convenient for theſe, and are united to them as they are more proper and agreeable to their Nature; according to which variety of Nature they undergo ſeveral Alterations, before they can be Aſſimilated. And the more the Blood grows to theſe delineated Threads, ſo much the more the fleſhy Maſſes of the Bowels encreaſe, and the reſt of the Parts alſo by degrees, are more and more compleated, and grow ſtronger and ſtronger, tho' ſome later, ſome ſooner, according as Nature has uſe for 'em.

The Heart acts, ſanguifies, and beats firſt of all.

XVI. *Whence it is that the Heart manifeſtly acts, ſanguifies, and beats firſt of all; becauſe the perfection and action of it, is of all others the firſt and moſt chiefly neceſſary:* And ſtill the Brain appears like a thicker ſort of puddle Water, when all the reſt of the Parts are upon their growth: And tho' afterwards it contribute ſomewhat beneficial to Nouriſhment, yet in the beginning, when all the ſlender Delineaments, are but juſt form'd, contain a kind of fermentaceous Quality in themſelves, and neither require nor can endure a ſtrong Fermentation, there is no need of its Aſſiſtance. Beſide the brain alſo many other Parts do but very ſlightly appear, till ſome time after the firſt Foundations are laid, and ſome Parts not till after the birth of the Infant, as the Teeth, tho' they were all delineated at the beginning. For as Nature, the Parts being already delineated, preſently acts by their aſſiſtance as her need requires, ſo does ſhe perfect the Organs not by growth, but as the neceſſity of Uſe requires their Perfection. And as we may collect what parts are form'd by their Action, tho' they cannot be diſcern'd by the Eye, ſo we may collect that theſe Parts are of ſpecial Uſe which are firſt finiſhed, among which are the Heart.

How the Embryo is nouriſhed.

XVII. *And thus it is apparent, that the* Embryo *is generated out of the prolific Principle contained in the Bubble, that it is afterwards nouriſhed, firſt by the Seed of the woman, and the melted remainder of the mans, afterwards with that ſeminal Nouriſhment and Blood, and laſtly with Blood alone.*

Whether the Seed flows out again after Conception.

XVIII. *This Opinion of ours is contrary to theirs, who alledg that man is produc'd and form'd out of the ſpecific Principle alone, that is, out of the ſpirituous and efficacious part of the Seed, but that the whole Maſs of the Seed beſide, is altogether unprofitable, and therefore flows out again after Conception. True it is, that the firſt Lineaments or Threads of the whole Body are form'd out of the Egg alone, infuſed into the womans Egg and collected in the Bubble; but it is as great a miſtake, that after the ſeparation of the prolific Principle, and the real Conception, that the reſt of the Seed flows out as unprofitable, as being repugnant,* 1. *to Reaſon.* 2. *To the Authorities of the beſt Phyſicians.* 3. *To Experience.*

1. *Reaſon.* Becauſe that when the Seed is received into the Womb, and once Conception happens, the Orifice of the Womb is ſo exactly cloſed, that nothing can flow out again.

2. *Authorities.* For *Hippocrates* expreſly declares, *That if a Woman after Copulation does not conceive, the Seed of both Sexes flows out again: But if ſhe conceive, the Seed never flows out again. For that being once cordially embraced, the Womb is cloſed up, the Orifice being contracted by reaſon of its Moiſture, and as well the womans as the mans Seed are mixed together. So that if a woman has had Children, and obſerves when the Seed firſt began to ſtay in her Body, ſhe ſhall know the day ſhe conceiv'd.*

The ſame *Hippocrates* in his Treatiſe

de

de Natura Pueri, has these words. *If the Geniture of both Parents stays in the womans Womb, then first, because the woman is seldom at rest, it is mingled, condens'd and thickens with heat.* The words of *Galen* are, *If the Seed remains in the Matrix, the woman will conceive.* And in another place, *I have read all the Physicians that have writ of this Matter, which I find to affirm the same thing, that if a woman will conceive, of necessity the mans Seed must remain in her Body.* In like manner *Macrobius. The Seed*, says he, *that after Injection does not come forth again in seven Hours, may be pronounc'd to stay in order to Conception.* Which most of the Ancients, both *Greeks*, and *Arabians*, in all their Writings assert, as having learn'd it from manifold Observation. Among the Moderns, *Fernelius*, *Ludovicus Mercatus*, and several others, maintain the same Doctrine.

3. *Experience.* For *Galen* writes that he has often been told by Persons experienced in those Affairs, that Mares, Bitches, Asses, Cows, Goats, and Sheep, manifestly retain the Seed in their Wombs; as also, that he himself has frequently made tryal of it, and always observ'd in all Creatures that retain'd their Seed after Conception, and became impregnated, that the Seed was still found in the Womb upon Dissection. Which if *Galen* found to be always true in brute Animals, why not in Women? But use confirms the same, for women certainly know themselves to be with child, if they observe their Privities to continue dry after Copulation, and that none of the Seed comes away from them. Ask a hundred women one after another, and they will unanimously confess that to be a certain sign of their Conceiving, and being with Child; and they should certainly know by that sign when they conceived, but that after Copulation in the Night they fall asleep; or after Copulation in the day time, taken up with other business, they never take exact Notice whether the Seed comes from them or no. Which not being diligently observed by 'em, they seldom know certainly when they conceiv'd, and begin their Reckoning from the time they miss'd their Flowers, and so are frequently mistaken in their Accompt.

Harvey's *Opinion that the Seed flows out again.*

XIX. ***But neither the foresaid Reason, nor the Authorities of the most famous Physicians, nor the Acknowledgments of the Women themselves, could prevail so far, but that*** Harvey ***will still maintain, that the Seed contributes nothing to the Growth and forming of the Parts, and for that reason asserts, that the Seed either does not enter the Womb, or being entered, flows out again, without Prejudice to Conception. Into which Error he has also drawn*** Regius, ***and several other Philosophers.*** The Reasons that confirm him in his Opinion, he takes from Ocular Testimony, as having dissected several Does, Hinds, and many other brute Creatures, yet never found any Seed in their wombs, tho' he believes several of those Creatures to have been with young. *In Bitches, Conies, and several other Animals*, saith he, *I have made tryal, that there is nothing to be found in the womb for several days after Coition, that I am convinced that the Birth does not proceed from the Seed, either of Male or Female injected into the womb in Coition, nor from the menstruous Blood, as the Matter, according to* Aristotle, *neither that there is any Conception presently after Coition; and that therefore it cannot be true, that in a prolific Coition there is any Matter prepared in the womb, which the Virtue of the male Seed coagulates like Rennet, for there is nothing at all to be seen therein for several days.* And in another Place, *Exercit.* 17. *In the Cavity of the womb*, saith he, *I never could find any Seed of the Male, nor any thing else that render'd toward Conception: And yet the Males every day copulated with the Females, and I dissected several of those Females, and this I have always found to be true by the Experience of many Years. Now when after frequent Tryals, I still met with nothing in the Cavity of the Womb, I began at first to doubt, whether the Seed of the Man could by any manner of way, either by injection or attraction, enter the Place of Conception. And at length often repeated Inspection confirm'd me in the Opinion, that nothing of Seed ever reached those Places.*

And from hence at last he concludes that the mans Seed neither contain'd in it self the active Power of Forming, nor was the matter out of which the thing was to be form'd; nor that it entered the Womb, or was therein detain'd: And that he might describe the Principle and Subject of Conception, he flies to Quality without Matter, to Species without Subject, and an idle Conception of the Womb without the Brain.

For, saith he, *because there is nothing sensible to be found in the Womb after Conception, and yet there is a necessity that there should be something to infertilize, and that cannot be Corporeal, it remains that we have Recourse to meer Conception, an l Conception of Species without Matter, that no man may question but that the same thing happens here, which happens in the Brain.*

And a little after, *As we from the Conception of a form or Idea in the Brain, produce another like it in our Actions. So the Idea or Species of the Parent being in the Womb, by the assistance of the forming Faculty begets a Birth resembling it, while he imprints upon his Work a Species which he has in himself immortal.*

And so he concludes that Conception is produced in the Womb by the receiving of Species's without, and that the Womb it self, while it stirs up the forming Faculty according to that Idea conceived in it self, is the principal Cause of Formation, whereas the whole Formation is accomplish'd in the Egg, both in and out of the prolifick Principle of the Seed; and the womb affords nothing but a convenient place and cherishing receptacle for the Seed.

Deusingius *his Opinion.*

XX. *Now tho'* Deusingius *contradicts* Harvey, *yet he seems to be in a great quandary, and shunning* Charybdis *for fear of falling into* Scylla, *proposes the Question quite otherwise than* Harvey, *but confirms his Opinion with no more solidity at all.* For he writes that the Seed of the Male, being injected into the Privities of the Woman, and as it were by infection, changes as well the accidental as substantial temper of the womb and whole body, and confers such a disposition upon the body and the womb, by which it is wrought to the top of maturity, and impregnated, as Fruits are ripen'd by the Summers heat: So that tho' afterwards the whole mass of the Male Seed flow forth of the womb after Coition, or tho' the spirituous portion also exhale into nothing, yet the spirituous substance of the Womans body receives such an impression from the said temper, as the spirituous portion of the Man's Seed first made by vertue of its own proper nature. In which words the learned Man seems to ascribe to the Seed of Man in conception no other effect, than that it changes the disposition of the Woman and her womb, and contributes to it an aptitude to form and find materials, but that the Seed of the Man after coition comes away again, as altogether useless: As if that change of temper, and preparation to maturity, were to be made in coition, so suddainly, and as it were at a jump, by the only injection of the Male Seed; and that the Woman, not long before ripe for Man of her self, through the increase of her own proper heat, and of blood and spirits, did not become fit for the generation of eggs and conception, and that conception did not in a short time happen after coition, but only upon a great and preceding preparation, and a long alteration of the Womans whole body, caus'd by the frequent injection of the Man's Seed. Besides, the Comparison is ill, that the Seed of the Man should mature the Woman, as the Sun ripens the Fruit; because a Woman is not matur'd by the Man's Seed, but by her own inward heat, and so produces such Fruit, that is, her own Seed included in the Egg, to cherish and ferment the prolific Principle separated from the Man's Seed, and infus'd into the Egg, and to set it at liberty; as also for the generating of the Tunicles and Membranes that enfold the Birth, and for the most proper and convenient Nourishment of the new-form'd Birth.

Harvey *deluded both himself and* Deusingius.

XXI. *So that* Harvey's *Inspections into the Conceptions of brute Animals, not only deluded himself but* Deusingius, Regius, *and several other learned Men, who suffered themselves to be led astray before they had throughly examin'd the matter.* I acknowledge my self to be an admirer of *Harvey's* Experiments, and his extraordinary Ingenuity and Industry in the Dissection of Beasts, and give him great Credit; and I believe that in most Beasts dissected after Coition, he found no Seed in the Womb: Now it does not follow from thence, what he would infer, That the Seed in Coition does not enter the Womb, and that it comes away again presently after Coition, and yet Conception happens, and therefore that the Seed is useless in Conception. For that those Inspections of *Harvey* do not certainly prove that the Seed was not detain'd in the Womb, when Conception was over, or at the time of conceiving: For tho' he never could find any Seed in the wombs of those Creatures, which he dissected, yet that concludes nothing of certainty, nor proves that those Beasts were impregnated, or that there would have been a Conception from former Coitions, had they been permitted longer

ger life. And certainly there are many Arguments that destroy both his Reasons and the Arguments drawn from his Experiments.

Harvey's *Experiments examin'd; first, that the Seed might fall out, and so no conception.*

XXII. 1. *The Seed injected might come away again after Coition, either of its own accord, as happens in Women that do not conceive; or shogg'd out, and so there might be no Conception.* For he himself writes, that *Does* and *Hinds* do copulate every day for a whole Month together, and therefore they many times copulate in vain: after which vain Coition the Seed flows again out of the Womb: For generally those Creatures conceive upon the last Copulation, especially those that bring forth but one at a time, because that after Conception they admit the Male no more. Now if *Harvey* in his Dissections did not light upon one of those *Does* which had not yet admitted the least conceiving Copulation, or at least had not as yet conceiv'd, 'twas no wonder he found no Seed in their Wombs, as being shaken out after Coition. Thus I remember about ten years ago, in the Company of several others, I saw a *Mare*, that as soon as the Horse had covered her, cast out the Seed again; but the Horse continuing to cover her for three or four days together, at length the last time she retain'd her Seed, and would not admit the Horse to cover her any more: So that if the Mare had been open'd the first or second day, there would have been no Seed found in her womb: But if she had been dissected after the last Coition, by which she conceiv'd, without doubt there would have been found Seed in her womb. And so would *Harvey* have found, had he light upon Does that had conceiv'd. For tho' in such a vast Herd of Deer several perhaps might have conceiv'd, it does not follow that he dissected those that were impregnated; altho' he might have accidentally fallen upon the one, as well as the other.

2. While those Creatures, after a long chace, are wearied, frightned, and at length kill'd, 'tis not to be wonder'd at, that tho' they should have conceiv'd two or three days before, if the Seed scarce yet melted should fall out of the womb, the Orifice being open'd, in that vast conturbation of Spirits, both before and after they are taken. For daily Experience tells us, that many Women upon terrible Frights, have not only cast forth the Seed conceived, but even the Birth it self already form'd.

3. If Bitches, Conies, and other Creatures urine and dung while they are killing, for fear of death; nay, if the fear of punishment only work the same effects upon some, no wonder that the Females of those Creatures, a few days or hours after Coition, should shed their conceiv'd Seed out of their wombs, while they are killing, and so that no Seed should be found in their wombs.

4. The Seed included in the womb, to the end that something may be produc'd out of it, undergoes a great alteration in the womb; nor does it altogether retain that form of substance which it had when it was first injected; and so perhaps *Harvey* did not believe it to be Seed, either being already melted, or else imagining it was not there, because so little.

That Harvey's *Experiments prove not what he labours to maintain.*

XXIII. *From what has been said, it appears that* Harvey's *Experiments cannot prove those things which he labours to maintain by them. And therefore it is not for any to suffer himself easily to be perswaded, that the Seed is of no use in Conception, but that it flows out again from the womb, either before or after Conception. And therefore I think there is more credit to be given to* Galen *in this particular, who being inform'd, as well by his own, as the Experiments of others, found the thing to be otherwise.* Moreover, I do not believe we ought to deny our credit to rational Women themselves, who by speaking satisfie us, that in Women that conceive, the Seed does not flow forth out of the womb; of which dumb and irrational Creatures are not able to give any account. Lastly, I cannot think there is any credit to be given to the Speculations taken from the sole inspection into brute Beasts, there being little of certainty in 'em, as being explain'd and wrested, rather according to the preconceived Opinion of the Inspecter, than according to Truth.

More than all this, *Harvey* himself writes, that about the eighteenth, or at most the twentieth day of *November*, he has seen, sometimes in the right, and sometimes in the left Horn of a *Does* womb, a *transparent colliquated matter*, and *crystalline*, contain'd within its own proper Tunicle, and in the middle *bloody Fibres*, and a *jumping point*. Which Matter, since it was not rain'd down from Heaven, I would fain know what else it could be, but the Seed of the Female inclos'd in the Egg, together with the jumping point, and increas'd by the

mass of the dissolv'd Masculine Seed, encompassed with the *Chorion* and *Amnion*? Now that he did not find the same Matter in many others, no question the Reason was, because he seldom lighted upon those Creatures that had *conceiv'd*.

The Seed, after Conception, flows not out of the womb.

XXIV. *And therefore there is no doubt to be made, but that the Seed after Conception, neither flows again out of the womb, neither is it, according to* Aristotle, *rarified into Spirit, and dissipated, or that it vanishes any other way, but that it is detain'd within the womb, and thus with that, together with that other Seed contain'd in the Womans Egg, the Birth is first of all both cherish'd and nourish'd.*

The Fœtus is form'd of the Seed, and nourish'd by the same.

XXV. *In the mean time I would not have any man think that I propound things absurd, while I affirm that the Birth is delineated and form'd out of the Seed, and in the beginning by the same Seed is also nourished; and so one and the same Seed serves for two several uses. For in the Seed there are two distinct parts; some spirituous, out of which the Birth is delineated and form'd; others thicker and less spirituous, from whence is taken the next Matter requisite for the first nourishment of the form'd parts, their increase and greater perfection*; yet the Birth can neither be form'd out of those, nor finish'd by them: For the same thing does not form and nourish, but divers parts of the same thing. The same thing happens in the Seed of Man, and all Creatures producing living Conceptions, as in the Seed of a Plant, wherein *Theophrastes* acknowledges two parts, one *spirituous*, upon which the prolific or procreating power depends; the other *thicker*, that nourishes the spirituous part, by vertue of which the Seed of the Plant springs forth, and casts out some leaves, tho' not set in the Earth, as containing in it self the Nourishment first requir'd.

But now let us return to the Bubble from whence the first Nourishment of the Embryo *led us astray.*

The Birth is form'd in the Bubble.

XXVI. *That the first and sole foundation of the Birth is wrought in this Bubble, out of the Crystalline humour contain'd therein, and surrounded with a peculiar invisible Pellicle,* Hippocrates *has observ'd, by that time the Seed has been six days old*: for he writes that he has seen the Internal Pellicle or little Skin, (that is the Bubble) whose innermost Liquor was transparent, out of the middle of which somewhat thin shot it self forth, which he thought to be the Navel.

The time of Formation.

XXVII. *As to the time of Formation, there is some dispute about it among Physicians.* Hippocrates *tells us, that the Seed being receiv'd into the womb, ought to have some appearances upon the seventh day, and that if the* Abortion *thrown out within that time, be put into water, and diligently view'd, all the first foundations of all the parts may be manifestly discern'd therein.* Others affirm this Formation of the parts not to be accomplish'd so soon as *seven days*, but after a longer time. *Strato* the *Peripatetic*, and *Diocles Caristius*, by the report of *Macrobius*, in his Comment upon *Scipio*'s *Dream*, asserted that the human figure was form'd within five weeks, or about the *thirty fifth day*, to the Bigness of a *Bee*, yet not so, but that all the Members, and all the designed Lineaments of the whole Body appeared in that *Epitome*. *Aristotle* averrs, that the little body of the Birth settles as it were in a little Membrane upon the *fortieth day*; which being broken, the Birth it self appears about the bigness of a large *Emmet*, with all the Members distinct, and all other things, Genitals and all. Which Opinion of *Aristotle* may be easily reconciled with that of *Hippocrates*: For he computes from the time that the Seed was injected into the womb to the whole, and manifest by visible formation of the Birth. Which time he asserts to be in all *forty days*. *Hippocrates* begins his Computation from the time that the Birth begins to be form'd into Members; that is to say, after the Seed being first melted in the womb, and the prolific Principle being separated from it, and fall'n down to the Egg through the *Tubes*, and there collected in the Bubble, (all which is done within the first days,) at length it begins to be dispers'd for the delineation of the Parts. Moreover, *Aristotle* describes the perfect and visible; *Hippocrates* the rude and scarce visible Formation of all the Parts: these requiring more, the other fewer days. *Fernelius*, agreeing with *Aristotle*, writes that he has seen a perfect Birth within the *fortieth day*; but does not tell us how big it was. Others more modern, say, they have observ'd it as big and as long as the little finger, within

within that time, toward the end of the third Month, about a handful long, and toward the fifth about a foot long; which however does not ſeem to be very probable, when I have ſeen the contrary with my own eyes. But without queſtion thoſe Modern Authors were deceived in this, that they did not underſtand the exact beginning of the Conception, as is apparent from the following Hiſtories of *Abortive Births*.

First Hiſtory.

XXVIII. Harvey *writes, that in a Female Conception as big as an Hen Egg, he found the Birth as long as a good big Bean, with a pretty big Head, which the Brain out-grew, like a kind of Comb; and that the Brain was like curdl'd Milk. Inſtead of a Scull there was a Membrane ſomewhat reſembling Leather; and the Face appear'd ſhap'd like a Dogs, without any Noſe to be ſeen.*

The Second Hiſtory.

XXIX. *Some years ſince I had an opportunity to ſee an Abortion of a few weeks, upon which I made theſe Obſervations.* The bigneſs of the Abortion, together with the Membrane, was about the quantity of an Hen-egg. The *Chorion* looſe, wrinkled, and ſomewhat rough and hairy without ſide, ſprinkled with many very ſmall Veins, all which met together at the top of it, to which there ſtuck a ſmall, fleſhie, long, ſhapeleſs, and bloody Maſs, from whence the ſaid Veins ſeem'd to derive themſelves. Furthermore, the ſame *Chorion* was eaſily ſeparated from the *Amnion*, and that with a very ſlight handling, except in that part where the ſaid little piece of fleſh ſtuck. But within the *Amnion* a certain watery Diſſolution, ſomewhat viſcous, and plentiful enough. In the middle of which there ſwam a ſmall *Embryo* every way free, and no where ſticking to the *Amnion*. The Trunk of this Body was hardly ſo big as the half of a ſmall Pea ſlit in two. At the top of which the Head was faſten'd to a moſt ſlender Neck, about as big as a ſilk Thread. The Head was very big in compariſon of the Trunk, equalling the fourth part of the whole Trunk; wherein black Eyes were very conſpicuous; the Noſe did not ſwell out, but in the place of it there appear'd a certain white Line. Nothing of the Ears was to be ſeen, as neither the Shape nor opening of the Mouth, only a ſmall overthwart Line offered it ſelf to view in the ſame place. Inſtead of a Scull, a thin Membrane girt the Brain, which ſhew'd like the diminutive white of an Egg. The Trunk did not ſeem diſtinguiſh'd into two Bellies, but ſeem'd to conſiſt all of one Belly, and in the inner part of it certain ſmall Bowels, covered with a thin tranſparent ſmall Membrane, ſhew'd themſelves, but ſo confuſedly, that they could not be diſtinguiſh'd one from the other. A little below the middle of the Trunk a ſlender whitiſh ſmall Branch iſſued forth, which was the Navel, but ſo ſhort, that the length of it hardly exceeded half the breadth of a ſlender Straw. Moreover, there appear'd above, certain obſcure delineations of the Arms; below, of the Thighs and Legs, in which the Fingers and Toes were only diſtinguiſh'd by ſmall little Lines. This Woman, when ſhe miſcarried, thought her ſelf to have been gone ſeven or eight weeks of her time.

The Third.

XXX. *Two years after that, another Woman miſcarried: the* Abortion *was about the bigneſs of a ſmall Hen-egg.* Without a fleſhie Particle ſtuck faſt to the Membranes; out of which fleſhie Particle, the Veſſels of the *Chorion* deriv'd themſelves, as I have obſerv'd in the preceding Abortion. But this was a little bigger, as being about the bigneſs of half a Nutmeg. The *Chorion* being open'd, no Liquor flow'd forth; for there was nothing contain'd between the two Membranes, nor could the *Allantois* or Urinary Tunicle be ſeen among 'em. Nevertheleſs the *Chorion* did not ſtick to the *Amnion*, but only was as it were placed upon it, and was eaſily ſeparated from it, with little handling, unleſs where the little piece of fleſh was joyn'd to it on the outer ſide, for there the *Amnion* was faſten'd to the *Chorion*. Within the *Amnion* the Diſſolution was found to be moderate as to quantity, in the middle of which I found a ſmall *Embryo*, with a large Head in compariſon of the whole, becauſe that all the reſt of the little Body ſeem'd to be three or four times bigger than the Head, which was no bigger than a ſmall Pea, and joyn'd with a ſmall neck about the thickneſs of three ſilk Threads twiſted together. In the hinder part of this lay the Brain, like a white Comb, and the whole Head was ſurrounded with a whole Skin, under which was the ſoft Brain ſtirr'd up like the white of an Egg. In the part before little black Eyes were apparently conſpicuous, but no Ears appear'd. A white little Line mark'd out the Place for the Noſe and Mouth. The

reſt

reſt of the Body ſhew'd it ſelf rudely delineated into a Trunk and ſmall Arteries; but was much more ſoft than in the foregoing *Abortment*, like a thicker ſort of Slime, that would not endure the leaſt touch without ſuffering an Injury. Perchance this extraordinary ſoftneſs proceeded from ſome Corruption, and becauſe the *Embryo* had been dead for ſome time; for the Lady had been ill three or four weeks before ſhe miſcarried, not knowing ſhe was with Child.

The fourth. XXXI. *In the Year* 1663. *in* December, *the ſame Lady again Miſcarried, after her Husband thought ſhe had been ſix weeks gone. The Abortment was about the bigneſs of a ſmall Hen-egg.* The fleſhie Particle outwardly cleaving to the Membranes was much bigger than in the foregoing Abortments, extending it ſelf half way the *Chorion*. Within the Membranes there was a ſufficient quantity of diſſolv'd Juice. Upon the diſſolution ſwam the ſlender *Embryo*, about the bigneſs of a great *Emet*, where the Head, manifeſtly to be diſtinguiſh'd, appear'd faſten'd to the ſmall Trunk, with two diminutive black little points, deſigning the place of the Eyes. The Trunk was ſomewhat bow'd like the Keel of a Boat, wherein ſome Bowels ſeem'd to appear, but ſo confuſedly as not to be diſtinguiſh'd: and for Arteries, there were none viſible. Beſides this little *Embryo*, a little cryſtal Bubble ſtill ſwam upon the ſame diſſolv'd Juice, (ſuch as I found in the foregoing Abortments together with the *Embryo*,) about the bigneſs of a ſmall Filbird, of a moſt tranſparent colour, wherein I could not perceive any delineations of the *Embryo*: perhaps out of this the Female Birth might be afterwards delineated; which they ſay is later brought to perfection than the Male, and ſo the production of Twins might happen.

The vanity of ſome men who pretend to ſhew dry'd Abortments, ſince ſcarce any thing can be diſcern'd before the fortieth day.

XXXII. *Now if the* Embryo *in the eighth or ninth week be no bigger than a* Pea *or a* Tare, *and about the fortieth day be no bigger than a large* Emet, *certainly their demonſtrations are to be accompted very ridiculous, who ſhewing ſome diminutive dry'd Abortments to be ſeen, endeavour'd to perſwade their Spectators that one is the Conception of ſix or eight days, the other of thirteen days or a fortnight; when as they are much bigger than thoſe by me ſeen and deſcrib'd; and that it is altogether very probable, that ſcarce any thing of the form'd* Embryo *can be diſcern'd by the Eye before the fortieth day.* Beſides that, it is manifeſt from the firſt form'd *Embryo*, that the whole maſs of the Male and Female Seed cannot be waſted in forming ſo ſmall a Body, when out of the leaſt drop of it ſuch a ſmall Body may be form'd as big as a large Emet: Therefore the reſt of the maſs, which flows not out of the womb, nor is waſted in forming the parts, cheriſhes and nouriſhes thoſe parts ſoon after, and contributes to their growth. But becauſe that reſidue of the Seed is ſoon conſum'd preſently, therefore a plentiful milkie Juice ſupplies its room, which then begins to flow into the *Ammon*, and that plentifully when the *Umbilical Veſſels* are grown to their due bulk.

The Birth not form'd of the whole maſs of Seed.

XXXIII. *From what has been ſaid, it is apparently manifeſt, that the Birth is form'd, not of the whole maſs of the Seed, but only of the moſt ſpirituous and thinneſt part thereof, collected firſt like a tranſparent Cryſtal into a diminutive Bubble, as has been already ſaid before.*

And now what others have obſerved, and I my ſelf have ſeen in reference to this Bubble, let us now in few words take notice.

First Obſervation concerning the Bubble of Riolanus.

XXXIV. *Riolanus* Animadverſ. in Laurent. tit. de formato Fœtu, *ſets down this Obſervation in reference to the Cryſtalline Bubble. Lately*, ſays he, *there was brought me the production of one Month, like a ſmall Hens egg, ſo wrapt about with its Membranes; of which the outermoſt was, as it were, like ſmall flocks, and very fibrous, the beginning and foundation of the* Placenta. *This Membrane being ſlit, three little baggs were conſpicuous within, contiguous one to another like little Cluſters of Grapes. Within thoſe Veſſels was contain'd a tranſparent water: and in one of the Bladders which was the middlemoſt, was to be ſeen a little Body like an Emet, and a fine ſlender Thread produc'd from it. That little Body reſembled a Birth without form, and not to be diſtinguiſh'd, as far as could be diſcern'd by the Eye, moſt nicely beholding that Miracle of Nature: But the ruddy Thread mark'd out the Navel.*

The diſcourſe concerning the Bubble illuſtrates the Propoſition.

XXXV. *This Paſſage does not a little illuſtrate our underſtanding of the Bubble. But I except againſt one Error therein, ariſing from a preconceived Opinion, that the* Embryo *was*

was forthwith nouriſh'd by the Navel: And I believe that Riolanus *was very much out as to that ſame Thread, which he alledges to be the Navel.* For as it is apparent from our ſecond preceding Relation, if in that *Embryo* ſeen by my ſelf, newly broken forth from the Bubble, and narrowly inſpected by my own Eyes, to which I give more credit than to the ſayings of others; and then more perfectly form'd, the Navel ſcarcely ſwell'd out to the breadth of half a ſmall Straw, nor any farther caſt forth any Thread, how much leſs could the Navel-thread be any farther extended from this ſame rude, undiſtinguiſhable, and ſcarcely begun Birth. Furthermore, at the beginning the parts are increas'd ſwifter or ſlower, according to the more or leſs neceſſity of their uſe. And in regard that at the beginning there is as yet no neceſſity of their Uſe, in regard the Birth does not as yet want Umbilical Blood, hence it comes to paſs, that at the beginning it is extended to a conſpicuous length, but afterwards by degrees grows out of the Birth; as we ſhall make appear *Cap.* 32.

The ſecond Obſervation of Riolanus.

XXXVI. *The ſame* Riolanus *adds another Obſervation of the ſame Nature, out of* Carpus's *Commentaries upon* Mundinus, *wherein* Carpus *obſerves three little Bubbles touching each other.* So alſo *Platerus*, *Quæſt. Med. Quæſt.* 1. writes, that in an Abortion about the bigneſs of a *Filbird*, he found three little Bubbles within a thin *Amnion*, and believes them to be the Foundations of the three principal Parts, the Heart, Brain, and Liver. For my part I never ſaw ſo ſmall an *Abortion*, about the bigneſs of a *Filbird*, nor ever read of any one beſides *Platerus* that ever ſaw ſuch another. Beſides, the Citations lately produced out of *Hippocrates*, *Ariſtotle*, and *Riolanus* teach us, that the Opinion of *Platerus* cannot be true, from whence it is apparent that the Birth is wholly delineated, form'd, and to be found in one Bubble only: In the other two *Riolanus* found a tranſparent Water: *Carpus* believes that *Embryo*'s would have alſo been found in thoſe Bubbles full of tranſparent Water, had they ſtay'd longer in the womb, but Female ones, which are later form'd. Which, according to the Experiments of *Hippocrates* and *Ariſtotle*, in ſome meaſure ſeems probable. At leaſt, this is moſt certain, that in and out of the tranſparent Liquor of one Bubble, the Birth is delineated and form'd. And therefore I am perſwaded that three Bubbles, as thoſe learned Perſons ſaw 'em, are very rarely to be ſeen, but that generally there is but one in the Conception, unleſs when a Woman conceives Twins, or three Children at a time; to which there muſt be added a fourth Bubble in Women that conceive more, like the Scotch-women, who frequently conceive four at a time.

The third Obſervation.

XXXVII. *Now I am the more confirm'd in this Opinion, by an Abortion that was brought to me at the ſame time that I was writing and inquiring into theſe things, by a noted Midwife, in which I found not Three, but only one Bubble ſurrounded with a thin Cobweb-like Membrane.* This lay hid between a plentiful Seminal Colliquation, which was watery, ſomewhat thick and viſcous, wrapt about with two Membranes, the *Chorion* and the *Amnion*, and ſwam at the top of it, free, and no where joyning to the *Amnion*. But to thoſe external Membranes, in one very little part, there ſtuck without ſide, a certain ſmall, fleſhie, ſoft, formleſs, and bloody Maſs, about the bigneſs of the twelfth part of the *Abortion*, which being ſomewhat endammaged in the outermoſt part of it, ſeem'd to have been torn from the Womb. The Bubble contained a tranſparent Water, clear as Cryſtal; wherein I could obſerve neither any blood, nor any thing elſe, unleſs it were ſome very ſmall little Lines, hardly diſcernable, which were without doubt the outſide Lineaments of the *Embryo*. The Woman that thus miſcarried, knew not that ſhe had conceiv'd, but being ſtruck with a ſuddain and more than ordinary dread, caſt that Matter out of her womb without any pain, and little ſtraining.

The fourth Obſervation.

XXXVIII. *About the ſame time I ſaw another very young Conception upon the Miſcarriage of a Miniſter's Wife, wherein I found in like manner one only Bubble very tranſparent and Cryſtalline, about the bigneſs of a Filbird, wherein there appear'd no little Lines, either bloody, white, or of any other Colour.* To the exteriour Membrane of that wrapt about the Colliquation, there ſtuck alſo very cloſe, as in the former, a little fleſhie and bloody Particle, endammaged without ſide, and as it were torn from the womb. From this moſt tender little Maſs, I apparently obſerv'd certain Blood-bearing little

Veſſels

Vessels to derive themselves and to spread themselves very numerously thorough the *Chorion*. But in the inner part of the *Amnion*, besides the seminal watry Colliquation, upon which the Bubble swam, I could not observe any thing bloody, nor any small Vessels in the Substance of it. These two Membranes were easily to be separated one from the other, neither was there any Liquor contained between 'em.

The Colliquated Matter & Bubble proceeds both from the man and womans Seed.

XXXIX. *The Magnitude of these two Abortions, the foregoing and this, was about the bigness of a Hen-Egg, and their Membranes contained more of the Colliquation than half an Egg-shell would hold; which in regard it could not altogether with the Bubble proceed from the mans Seed, of necessity the womans Seed must be mixed with it, tho' the Bubble without all Question sprang solely out of the mans Seed.*

In one Birth, but one only Bubble.

XL. *Taught by these two Experiments, I am apt to believe, that there is but only one Bubble in the Conception generally, and seldome any more, unless when more Births are to be form'd.* But tho' hitherto I never saw any more, yet I am loth to contradict the Experience of *Riolanus*, *Carpus*, and *Platerus*, or to doubt of the Truth of it: And perhaps it may be my Chance to see more at another time.

In what Order the Parts are form'd.

XLI. *In the Formation of the Birth, the more curious Question yet remains; which Parts of the Body are form'd in the first place, which in the second, which in the third, and which in the last Place.* Aristot. l. de Invent. Writes that the Heart of Creatures endued with Blood is the first generated, which he observ'd in Eggs, after the Hen had sate three Days and as many Nights, as he asserts *l.* 6. *de hist. Animal.* *Ent* is of *Aristotle*'s Opinion, believing the *Heart* first to be form'd, and to be the efficient Cause of the forming the rest of the Parts. *The Seed*, says he, *emitted in Copulation into the Womb by the Male, constitutes only the Heart in Conception; for no part of the Creature consists of Seed besides the Heart.* And in another place, he says, *That the Heart moves not only after the Birth is form'd, but also from the Beginning, and is the efficient, not the material Cause of the Formation.* With *Ent* seems *Regius* to agree, *l.* 4. *Philos. Natur.* Others believe the Brain, others the Liver, others that they are all three form'd together; and afterwards the Guts, the Spleen, and Lungs. And this is the Opinion of *Galen*, *l.* 4. *de Usu Partium*, which many follow. *The Humour*, says he, *that smears the inner Surface of the Womb, is turn'd into a Membrane, wherein the forming Spirit being every way enclosed, puts forth its natural Motions, procreating three Points, answering to the three principal Parts, which being swell'd and distended by the Violence of the Heat, form their Bellies, the Heart, the Breast, the Brain, the Head, the Liver, the Abdomen. Then the other Parts are delineated and form'd together, and then by degrees flows the thin Blood to their Nourishment. Others* with *Bauhinus*, believe the umbilical Vessels to be first produced, as being chiefly and first of all necessary in respect of Nourishment. *Others* affirm the Bones to be first form'd, as being the Basis and necessary Foundation of the whole Body. And thus one judges one way, another another way, of a thing so obscure. But who, I would fain know survey'd Nature at her work, that he should be able to know all these things so exactly? If the *Embryo* in forty days be no bigger than an *Emmet*, how small must it be upon the thirtieth Day? within which time nevertheless all the Delineations are perfect, tho' not discernable to our Eyes. Who in that small Body shall determine which Part is formed first, which in the second, and which in the last Place? These are Mysteries which the sublime Creator thought fit to conceal from our Understanding: so that if we make any farther Inquiry into 'em, *Galen* will reprehend us. *If thou inquirest*, says he, *over nicely how these things are made, thou wilt be convinced that thou understand'st neither thy own Weakness, nor the Omnipotency of the Workmaster.*

All the Parts form'd together.

XLII. *In the mean time, if it be lawful in a Matter so obscure to make any Conjectures, I believe that all the solid Parts are delineated and form'd together, because they do not mutually depend one upon another, but are all the immediate Works of Nature. Moreover one cannot be, or act without the other: A Body cannot be without a more solid Foundation, which is afterwards to be Bony. The Heart cannot act without Veins and Arteries, nor the Brain without Nerves,*

Nerves, nor the Stomach without Guts, &c. *For there is no reason why one Part should be form'd before another.* In the foresaid Bubble the Matter is contain'd which is proper for the Generation of all the Parts, which wants no farther Preparation; and the *Architectonic* Spirit may equally delineate and form at the same time all the Parts out of the same matter. And wherefore should it form the Heart, as *Ent* would have it, sooner than the other Parts? To prepare Matter for the Generation of the rest? That's done already. Certainly it cannot be said that the Heart generates and forms other Parts, when it only prepares Matter for the Nourishment and Growth of the whole, from which not their Generation proceeds, but their greater Perfection being generated to perform their several Offices. For if the Heart at the beginning should generate other Parts, why does it not produce new Parts after the Birth of the Infant, when it is stronger, and operates more powerfully? That it prepares Nourishment for all the Parts after the Child is born, is confessed by all, why should it not do the same at the beginning? Shall it have any other Action assigned it at this, than at another time. But you will say the Heart is first of all conspicuous, the rest of the Bowels and all the other Parts appear later, and therefore is first form'd. Now who can discern in an *Embryo*, at the beginning, no bigger than an Emmet, what Parts are already form'd with the beating Heart? Which tho' it be the defect of our Sight, yet Reason sufficiently teaches us, that all the Parts are delineated together, since the Harmony of all together is so great and so necessary, that they cannot subsist or act one without another. And indeed it seems but probable that the forming Spirits contain'd in the Bubble, and beginning the Formation of all the Parts more vigorously perform their Work, and more speedily strengthen and perfect all Parts already delineated, after they are at more Liberty from the thicker Colliquation, as being assisted by the Heat of the Heart, excited and kindled by a particular Fermentation: But certain it is, that before that Assistance they began the Formation of all and singular the Parts: Of which, tho' such and such first appear, in the forming whereof most Spirits were employ'd, and of which there is the greatest Necessity for their Use, however this does not exclude the Delineation of the rest of the Parts, which our Sight cannot discern.

All the Parts are form'd together.

XLIII. *Here if any one will object that perhaps the spermatick Parts are delineated together, but that the bloody Parts are afterwards of necessity to be produc'd. I answer, that when we speak of the Formation of the Parts, we speak of the first Delineations, or Out-lines of all the Parts, and all those we say are form'd out of the Seed alone; into which the bloody Nutriment is afterwards infused, by which they acquire a greater Bulk and Bigness.* Yet in the mean time there is no bloody part in the whole Body, which is not intermixed with spermatic Threads: and so no part can truly be said to be form'd out of the Blood; and to subsist without a spermatic Foundation. This was the ancient Opinion of *Hippocrates*. *All the Members*, says he, *are discerned and augmented together, not one before or after another: only those that are naturally bigger, are seen before the other, tho' they were not form'd before.* And in another place, *There is not in my Opinion, any beginning of the Body; but all the Parts seem equally to be both beginning and end together. For the Circle being drawn, there is no end to be found.*

An Objection here answered.

Now what Parts are first visible, how the order of Formation proceeds gradually, as far as the Eye can discern, is elegantly described by *Harvey*, *Tract. de generat. Animal.* whom the Reader may do well to consult, together with *Antony Everard* in his *Lib. de Ortu Animal.*

XLIV. *But now seeing the form'd Parts came once to associate to themselves, and assimilate the Nourishment brought 'em, and so begin to grow by Nutrition; seeing the Heart also begins its natural Action of Sanguification from its smallest Point or Beginning: Some more curiously inquire; whether the Brain, which is very soft in the Embryo, makes animal Spirits, and by their Assistance performs animal Actions.* I answer, *That as the Actions of many parts are idle at first, as of the Lungs, Eyes, Ears, Teeth, and Stones*, &c. *Of which there is no absolute Necessity at the Beginning; so the Actions of the Brain, Liver, and Spleen being more necessary, be-*

Whether the Brain in the Embryo makes animal Spirits and performs animal Actions.

gin at the Beginning, but so weakly, by reason of the Infirmity of the Organs, that they cannot be discern'd. But by degrees the more perfect they grow, the more perceptible they are. And hence it is probable that the Brain at the beginning may begin to make animal Spirits, but very few and very weak, because there is less need of 'em at the beginning: But the stronger the Brain grows, and the more need of Spirits there is, the stronger and more vigorous Spirits it makes. As is apparent by that time a woman has gone half her time, when the Child begins to stir, which Motion cannot be perform'd without those more plentiful Spirits. And from that time the Brain is so corroborated, that at length it begets more plentiful and vigorous Spirits fit to perform the chiefest animal Actions. Which principal Actions however are idle in the Birth inclosed in the Womb, where there is no occasion or necessity of Imagination, Thought, or Memory: But the Infant being born, the Brain increasing in Strength, begets more vigorous and efficacious Spirits. Therefore Children as they are weaker of Body, so are they weaker in their Intellectuals: Because the Faculties of the Soul do not well perform their Offices till the Organs are perfect; only the Feeling and moving Faculties begin to act from the time of the Childs quickning. For from that time the Motion of the Infant is peceived by the Mother, and the Birth sympathizes with the Mothers Pains. Which *Cardanus* proves by pouring cold water upon the Belly of the Mother, for thereby the Infant will be forc'd to move in the womb, and by that means he tries whether women with Child are quick or no.

Whether the Child in the Womb sleeps and wakes?

XLV. *I shall here add one thing more, which is controverted among the Philosophers whether the Infant wakes and sleeps in the Womb?* Avicen *utterly denies any such thing. However Women with Child will tell ye, that they manifestly feel the Motion of the Child when it is awake, and the resting of it when it sleeps.* But we are to say that Sleep is the Rest of the Senses for the repairing and renewing the animal Spirits wasted by watching, occasioned by the Contraction of the Pores and Passages of the Brain. On the contrary that Wakefulness is a convenient opening of the Pores of the Brain, and flowing in of the animal Spirits through them into the Organs of the Senses, sufficient for the performance of their Actions. But neither of these can be said to belong to the birth included in the womb. For *First*, the Spirits are not wasted, but only few, and those weak are made, and therefore the Rest, which is in the Infant unborn, cannot be call'd Sleep, because it proceeds not from the Causes of Sleep, that is to say, the wast of the Spirits, and the Contraction of the Pores of the brain, nor has it the end of Sleep, which is the Restoration of decay'd and wasted Spirits. *Secondly*, The Motion of the Infant cannot be said to be waking, because it wants the true Causes of waking, which is the opening of the Pores of the brain, and an Influx of Spirits into the Organs of Sense, sufficient to perform the Actions of the Senses. The first cannot be, by reason of the extream Moisture and Softness of the brain: Nor the latter, by reason there is not as yet generated a sufficient Quantity of Spirits. Moreover the Motion and Feeling of the Infant does not presuppose a necessity of waking: For that men grown up, and matur'd by age, when fast asleep many times tumble and toss in their Sleep, and sometimes walk and talk, and being prick'd feel and contract their injured Members, and yet never wake. Therefore we must conclude that the Infant in the womb cannot be truly said to sleep or wake, but only sometimes to rest and sometimes to be mov'd.

Another Digression. What is the Architectonic Vertue?

XLVI. *Here perhaps by way of a Corollary some one may ask me, what is that same Architectonic Vertue latent in the prolific Seed which performs the Formation of the Parts?* In the foregoing Chapter we have discoursed at large concerning the enlivening Spirit implanted in the Prolific Seed, as it is the Subject of the first forming Spirit; but because no Spirit of it self and by its own Power, seems able to perfect Generation, unless it have in its self some effective Principle, by virtue whereof it produces that Effect; hence the Question arises what that is that affords that active Force to the Spirit, and power to form a living body, and endues the Matter with all manner of Perfection, and produces Order, Figure, Growth, Number, Situation, and those other things which are observed in living bodies? Which is a thing hitherto unknown, and has held the Minds of all Philosophers in deep Suspense. Of whom the greatest part have rather chosen tacitly

citly to admire the Supream Operator and his work, than to unfold him, and so affirm with *Lactantius*, *That Man contributes nothing to his Birth but the Matter, which is the Seed, but that all the rest is the handy work of God, the Conception, the forming of the Body, the inspiration of the Soul, and the conservation of the Parts. In which sense*, says *Harvey*, *most truly and piously does he believe, who deduces the Generations of all things from the same Eternal and Omnipotent Deity, upon whose pleasure depends the Universality of the things themselves.* But others, who believe that the Bounds of Nature are not so slightly to be skipped over, nor think that in the Inquiries after the Principles of Generation, there is such a necessity to have recourse to the first Architect and Governour of the whole Universe, but that the first forming and efficient Cause created by God, with the Things themselves, and infus'd and planted within 'em, is to be sought out of the Things themselves, more arrogantly have presum'd to give us a clearer Explication of the Matter by *Philosophical Reason*, yet differing in their Opinions, which are various and manifold.

What the Architectonic Power is? various Opinions about it.

XLVII. *For* Galen *calls this Architectonic Power, sometimes by the name of* Nature; *sometimes* Natural Heat, *sometimes the* Inbred Temperament, *sometimes the* Spirit, *which he affirms to be a Substance of it self moveable, and always moveable.* Aristotle *distinguishing between the* Heat *or* Spirit *of the Seed and* Nature; *asserts the Artichectonic Power to be that Nature which is in the Spirit of the Seed; and therefore distinct from the Spirit it self, which is inherent in the Spirit as in its Subject, and acts upon the Spirit as its Matter.* This Nature in the Spirit of the Seed was also acknowledged by *Hippocrates*; saying, *That it is learned, tho' it has not learnt rightly to act.* Not that it is Rational, but because, as *Galen* explains it, it acts of it self all that is necessary to be acted, without any direction. Hence *Deusingius* defines it to be a *certain immaterial Substance arising out of the Matter so determin'd to the Matter by the Supream God, that it can neither be, nor subsist, nor operate without it.*

This same Architectonic Vertue, others, with *Avicen*, call the *Intelligence*; others, with *Averrhoes* and *Scotus*, a *Cœlestial Force*, or a *Divine Efficacy*. *Jacob Scheggius* calls it λόγον ποιητικὸν, or πλαστικὸν, *active* or *forming Reason*; and says that by the word *Reason*, or λόγος, he understands a *Substantial Form, which is not to be apprehended by Sense, but by the Understanding and Reason.* And so while he seems to speak something, he says nothing at all.

The opinion of the Platonists.

XLVIII. *The* Platonics *call it a General Soul diffus'd through the whole World, which according to the diversity of Materials and Seeds, produces various Generations; as a Plant from the Seed of a Plant, a Man from the Seed of a Man, a Horse from that of a Horse, a Fish from that of a Fish, &c.* But *Plotin*, the great *Platonist*, distinguishes this same Architectonic Vertue from the Platonic Soul of the World, as produc'd from that by which it is produc'd: and therefore he calls it Nature flowing from the Soul of the World; which he says is the Essential Act of it, and the Life depending upon it. *Themistius* says, that the forming Power is the *Soul inclos'd in the Seed, potentially enliven'd. Deusingius*, in his Original of the Soul, calls it *Nature in the Seed*; that is, as he explains himself, *a Soul potentially subsisting in the Seed, being in it self the Beginning and Cause of Motion:* But in a Body already form'd, he calls it the *Soul actually subsisting.* And so without any necessity at all, distinguishes one and the same thing into two; and gives it two distinct names, as it either rests or acts, and according to the diversity of the Subject to be form'd, or else already form'd. Just as if a man distinguishing between a Painter lazily sleeping, or painting awake, should call *the one*, *Nature* latent in his Spirit, as one that could paint if he were awake; and *the other* a real Painter, as one actually painting: as if the Painter that slept were not as much a Painter, as he that actually painted. Whereas, as it appears by the Effects, that which is able to form a Body at first out of the Seed, and that which actually forms, were not one and the same thing: and so by a certain continuation the form of the thing formed remains. This Opinion of his *Deusingius* seems to have drawn from the Institutes of the *Platonists*; who distinguish between the *Soul*, and *Being a Soul*, that is, between the *Substance of the Soul*, which is said to be in the Seed; and the Appellation of *Nature*, and the *Soul which acts at this present*, and is the form of the form'd Body. *Fernelius* calls the *Plastic* Power a *Spirit*; but he does

Plotinus makes a distinction between the Architectonic Vertue and the Platonic Soul of the World.

not mean such a common Spirit, which the Physicians say is rais'd by the preparations of the Bowels out of the Humours; but some other Spirit of far sublimer Excellency: *For*, says he, *this Spirit is an Ethereal Body, the Seat and Bond of Heat and the Faculties, and the first Instrument of the Duty to be perform'd.* And *Lib.* 2. *de Abdit. c.* 10. he believes it to be something that flows down from Heaven: *For*, says he, *the Heaven without any Seed produces many, both Creatures and Plants, but the Seed generates nothing without the Heaven. The Seed only prepares aptly and conveniently Materials for the begetting of Things; the Heaven sends into the Matter prepar'd Form, and consummate Perfection, and raises Life in all Things.* A little after he adds, *One Form of Heaven within its Power comprehends all the Forms that ever were or can be of all Creatures, Plants, Stones, and Metals, and impregnated with those innumerable Forms, casts as in a Mold, and generates all things out of it self.*

Opinions concerning this Plastic Vertue.

XLIX. *Others believe the* Plastic Vertue *to be a certain Power flowing into the Seed from the Soul of the Mother. Others call it a* Vegetative Soul; *and make no distinction between this and* Nature; *but say that Fertile Seed of necessity must be enlivened.* This Soul of the Seed *Julius Scaliger* and *Ludovicus Mercatus* stiffly defend. And *Sennertus* following their footsteps, *Institut. Med. lib.* 1. *cap.* 10. has these words: *They seem all to me to be in an Error, who deny the Soul, which is the Cause of Formation, to be in the Seed: For if you grant the forming power to be in the Seed, you must allow the Soul to be likewise in it. For in regard the* Powers *are not separable from the Soul, of which they are the* Powers, *it is impossible that the Powers proper to any thing should be in a Subject, wherein the Form is not from whence the Power flows. And since we come to the knowledge of the latent Essence by the Operations, what's the reason we do not attribute a Soul to the Seed, that sufficiently manifests it self therein by its Operations. But they are two: the enlivening of the Seed and the Conception; and the forming of all the parts that are necessary for the Actions of Life. For every Soul, as is manifest in the Seed of Plants, is preserv'd while the Soul is in it, and remains prolific for some time; and while it is sound and uncorrupted, in a proper place, and with convenient Nourishment, operates as living, and exercises its operations upon the matter at hand; which is not only to be seen in some Creatures by the Action it self, but in the regenerating of some parts, especially in Plants. For the same Operations are observ'd in the Seed, and in Plants found in all their parts, which shew the same Agent in both. For it is altogether the same Operation whereby the Soul latent in the Seed forms the Body of the Plant out of the Matter attracted, and afterwards every year restores the fallen Leaves and gather'd Flowers, and thrusts out new Branches and new Roots; and therefore it is a sign and Argument of the same Faculty, and of the same Soul. And this not only in Plants, but also in the Seeds of perfect Creatures, must of necessity be allow'd to be done: For as the Flesh is not made out of Blood, unless the Flesh it self enliven'd change the Blood into Flesh, much less shall a Creature be made of Seed, if the Seed want a Soul.* And a little after he adds; *For the Body of Creatures being the most excellent and perfect, it follows that what is not enlivened cannot be the principal Cause of the enlivened Body, but that the Body enlivened is produced by a Body enlivened as the principal Cause.* And certainly these Arguments of *Sennertus* are of great weight to prove that there is a Vegetative Soul in all generated Bodies: which is also stiffly maintain'd by *Deusingius, De Gener. Fœt. in Utero, part.* 2. *sect.* 1.

Whence the Seed has its Soul.

L. *But because a Doubt may here arise, from whence the Seed has this Soul, it will not be amiss to add something for the clearer illustration and confirmation of the said Opinion.* We must know then that all and singular the parts of a living animated Body, ought to participate of that Soul, and to live by it; and hence that which is separated to the perfection of the Seed out of the several parts, ought also to participate of the same Soul, which is also to intermix with the Mass of the Seed. And because out of all and every part, something of most spirituous parts, like Atoms, is allow'd to the making and perfection of the Seed; hence it comes to pass, that the Epitome of the whole animated Body endu'd with the like Soul, is contain'd in the Seed: and that Soul, the Seed being deposited in a convenient place, is separated from the thicker parts of the Seed, by the Heat, with that same Matter of the Seed wherein it inheres, that is to say, the most spirituous part divided from all and every the other parts, and rows'd into Action, and so throughout forms a resemblance to that form which is separated together with

that

that same subtile part of the Seed; unless prevented and hinder'd in its Operation, or that it be extinguish'd and suffocated by any defect of the Heat or circumfus'd Matter.

An objection, that the forms of animated Beings are indivisible, answered.

LI. *But it may be objected, That the Forms of animated Beings are indivisible, and hence that no parts of the Soul can be separated from the single parts, but that those parts meeting together in the Seed, constitute the whole and entire Soul:* To which I answer; *That the Forms of animated Beings are not of themselves divisible; however they may be divided according to the division of the Matter, so that the Matter be such, wherein the Soul can commodiously lye hid, and out of which it may be rais'd again to its duty, by the natural Heat temper'd to a convenient degree.* This is apparent to the Eye in a *Willow*, wherein any Bough being torn off from the Tree, the Soul is divided according to the division of the Matter, and as it remains in the Tree it self, so likewise in the Bough; as appears by its Operation. For that Bough being planted in a moist Ground, the present Soul acts in it forthwith, and produces Leaves, Roots, and Boughs, and the Mother Tree it self shews no less the presence of the Soul in it self by the same Operations. So likewise in Creatures, that same spirituous Essence which is separated from all the several living parts to be carried to the Seed, participates of the same Soul of the parts out of which it is separated, as being able to afford a convenient Domicil for the Soul, (seeing that where such a Domicil cannot be afforded, the living Soul fails) and so being mix'd with the Seed, it causes the Seed to be potentially animated, if the substance of the Seed be rightly tempered; which Soul, potentially lying hid therein, the Seed being deposited in a convenient place, being afterwards freed from the Fetters of the thicker Substance wherein it is enclos'd, is rais'd into Action; and acting forms out of the Subject wherein it inheres, like parts to those out of which the Separation was made, as being of the same *Species* with the Soul out of which it was separated.

How Aristotle *and his Followers are to be understood.*

LII. *And therefore when it is said by* Aristotle, *and other Philosophers, That the Soul lies hid potentially only in the Seed; this is not to be understood, as if the Essence of the Soul were not present, but in reference to its being intangled in the other thicker Matter of the Seed, so that it cannot act till disintangled from it, the Seed being deposited in some convenient place, by the Heat which dissolves the said Matter; but so separated, it acts forthwith: and out of its spirituous Subject separated from the parts of the Creature, delineates and forms what is to be form'd, and increases it with the next adjacent Nutriment.* For the Seed being of the number of *Efficients*, and seeing every *Agent* acts, not as it is potentially but actually such, it must not be denied but that the Soul is actually in the Seed, tho' by reason of the Impediments its Action does not presently appear.

Whether that Soul which forms the Birth, be in the Man's Seed only, or in the Womans also.

LIII. *But here it may be question'd, Whether that Soul which forms the Birth be only in the Man's Seed, or as well in the Womans? I say that it is only in the Man's Seed: for if part of the Soul should proceed from the Man, part from the Woman, then the Soul would prove a compound thing, whereas it is meerly simple.* Or if it should be deriv'd all from the Male, and all from the Woman, then there would be two Principles of Formation, of which one would be superfluous. For there would be no necessity that the acting Principle of the Male should be joyned with the acting Principle of the Female; for that the latter having an acting Principle in it self, and a place convenient, as the womb, convenient nourishment, and all other things convenient, would not want any other efficient Principle of the Male, but might conceive in it self, and form the Birth out of its animated Seed with the Coition of the Male. And in Creatures that lay Eggs, a Chicken might be hatch'd out of Wind-eggs without the Cock's treading. Neither of which were ever heard of.

The Opinion of Parisanus.

LIV. Æmilius Parisanus, *tho' he understood not this Mystery exactly, yet seems to have observ'd something obscurely, and therefore he constitutes a twofold Seed*; he had better have said, twofold parts of the Seed: one generated in the Genital Parts, which he denies to be animated; the other not generated in the Genital Parts, but divided from the whole, which he allows to be animated.

LV.

Whether the Soul be Rational.

LV. *Others, who will not allow in Mankind any other Soul particularly than the* Rational, *assert that That alone perfects the Lineaments of all the Parts out of the Seminal Matter conveniently offer'd, and is the Architect of its own Habitation; and stiffly uphold their Opinion with several Arguments, and so tacitly endeavour to maintain that the* Rational Soul *is* ex traduce, *or by* Propagation, *no otherwise than as the Body is propagated.* Concerning which may be read that most acute *Tractate* of the *Generation of Living Creatures*, written by *Sennertus.*

See also Bartholinus's *Anatomic Controversies upon the same Subject.*

The Soul not ex traduce.

LVI. *But these Principles most Philosophers, and all Divines oppose with great heat, and affirm the* Rational Soul *not to be propagated, but* to be created and infused. *To whose Opinion we readily submit; because the Soul is not of that nature that it can produce any thing of it self; it has nothing to do in the Formation of the Body, nor with any Natural Actions, it is not to be divided into parts, nor corruptible as the rest of the Body, but immutable, and separable from the Body which it inspires.* Besides that, it is not created like the Bodies of Creatures, which were commanded to be produced out of Earth and Water, according to their kind, wherein the Vegetative Soul of every one is included: but after the whole Body of Man was form'd alive out of the Earth, God is said to have breathed into him the Breath of Life, and then he became a living Creature. Whence it is manifestly apparent, that the Rational Soul of Man, inspired by God, was not form'd out of Earth, Water, or any other corruptible Matter, like his corruptible Body, which was form'd out of Clay, before the breathing of his Soul into him: But that it proceeded incorruptible and simple from the immediate Operation of God, without any parts, by the separation of which it could be dissolv'd and dye, as the Body for the same Reason perishes with its vegetable Soul; and subsists of it self when its Temporal Habitation is fallen. For which Reason Man is not only said to live Naturally, like other Creatures, but after the Image of God, which sort of living is not ascrib'd to any other Creatures.

That the Soul is not Rational.

LVII. *But these latter, tho' they seem to discourse rightly and truly of the Creation and Infusion of the Rational Soul, yet if they do not likewise admit a Vegetative Soul in Man, they are under a gross mistake, nor do they unfold the first Efficient Principle, concerning the Explanation of which the Question is here, and not of the Original of the Rational Soul.* Against those therefore that will not admit a Vegetative Soul in Man, I bring these two powerful Arguments.

First, Seeing that the Rational Soul is not propagated by Generation, but Created, of necessity it must be infus'd, and that either into a living or a dead Body. Not into a dead Body, for that Soul cannot inhabit a dead Body, nor enliven it, for its life is different from the life of the Body; which perishes while the Soul departs out of the Body, and lives to perpetuity: Therefore it is infus'd into a living Body: What then rais'd Life in the Body before the Infusion of the Rational Soul? It will be said perhaps, That at the same time that the Parts are to be delineated, the Rational Soul is infus'd, and that it is which introduces Life, and is Life it self. I answer, Not when they are to be delineated, but after all the Parts are compleatly delineated and form'd, then the Rational Soul is infus'd, according to the Testimony of the Scripture it self: where it is said that God first form'd Man out of the Dust of the Earth; (observe the word *Man*, therefore a living Creature, or a Creature endued with a Vegetative Soul;) and then inspired into him the Breath of Life, and he became a living Creature; as much as to say, that then was inspired into him his perpetual living and Immortal Soul. Therefore, as then, so also afterwards the Rational Soul does not form and enliven the Body, but is infus'd into the Body form'd and living: I say *living*, for that which forms the Body, of necessity enlivens it, and lives it self: For such a wonderful Structure cannot be form'd by a dead thing; nor by Heat alone, which only serves to attenuate and melt the Substance of the Seed, and rowse and set at liberty the forming Spirit, lying hid and entangled within it, and excite it to action, not able of it self to form the Parts of the Body, nor to adjust the order and shape of all its Parts. And therefore it is not the *Rational Soul*, but this same enlivening Spirit (which *Galen* calls *Nature*,

ture, we the *Vegetative Soul*) rais'd out of the Seed it self wherein it is potentially, is that which out of it self, and the Subject wherein it abides, and out of which it proceeded, forms and enlivens the Body, and all its agreeing Parts; into which being form'd and living, the Rational Soul is afterwards infus'd, and united to it, to determine and temper the Motions of the Corporeal Soul, till the Body, proving at length unfit to entertain it any longer, it departs out of it; not being the occasion of Death, of it self, but chas'd and expell'd from its Habitatation by the death of the Body: So no way guilty of the death of the Body by its recess, as by its access it contributed nothing to its life. This is apparent from hence, for that the Immortal Soul cannot give Mortal Life, of which it is destitute it self, to a Body corruptible and separable from it. For whatever gives a living Form to a Body, that also gives a Life and Form like to it self, as is apparent in all Brutes and Plants: Therefore if the Rational Soul were to give a Form to the Body, it would of necessity give an Immortal Form like its own, such a one as is not in the Body.

The Rational Soul not present when the parts were first delineated.

LVIII. *Moreover, it is hardly to be believ'd, that when the Parts came first to be delineated, that the Rational Soul should be present at that beginning as the first Agent; and more improbable to be believed, that when the* Embryo *first delineated is cast out of the womb by Abortion, no bigger than an Emmet or a small Pea, from a Body hardly discernable, a Rational Soul should be cast forth at the same time, that should be liable to give an account of Good and Evil Actions at the last* * *Day, or else to perish with it.*

* *This favours too much of* Calvin's *Doctrine, for the usual Doctrines of Original Sin are made the great foundation of that horrible Proposition concerning Reprobation, the consequences of which reproach God with Injustice, they charge God foolishly, and deny his Goodness and his Wisdom in many Instances. For (as a learned Divine of the Church of* England *says)* 1. *If God decrees us to be born sinners, Then he makes us to be sinners; and then where is his Goodness?* 2. *If God damns any for that, he damns us for what we could not help, and for what himself did; and then where is his Justice?* 3. *If God sentence us to that damnation, which he cannot in justice inflict; where is his Wisdom?* 4. *If God for the sin of* Adam, *brings upon us a necessity of sinning; where is our Liberty, and why is a Law imposed against sin?* 5. *If God does cast Infants into Hell for the sin of others, and yet did not condemn devils but for their own sin; where is his Love to Mankind?* 6. *If God cause the damnation of so many millions of persons, who are no sinners on their own stock, and yet swears, that he* desireth not the death of a sinner; *where then is his Mercy, and where his Truth?* 7. *If God has given us a Nature by derivation which is wholly corrupted; then how can it be that all which God made is Good? where then is his Providence and Power, and where the Glory of the Creation? But since God is all Goodness, and Justice, and Wisdom, and Love, and that he governs all things and all men wisely and holily, and that he gives us a wise Law; and binds that Law on us by Promises and Threatnings; I think there is reason to assert these things to the Glory of the Divine Majesty. Thus far that excellent Person.* Salmon.

Nor is it for us to judge of heavenly Matters above the reach of our Understandings, especially of the time of the Infusion of this Rational Soul: Though they seem to determine something probable concerning it, who judging rightly according to Truth, that the *Rational Soul* is created by God ἀμέσως, or immediately, assert with St. *Austin*, *That the Soul is infus'd by Creation, and created by Infusion:* that is, that it was not first fram'd in Heaven to be sent into the form'd Body; but that it is united to the Body at the moment of Creation, and created at the very moment of Infusion. But whether that Creation and Association happens at the beginning of the forming of the Body, or whether in the first, second, third, or fourth Month, or in any other Month after the Birth began to be form'd; or at what time the Body may befit to receive the Soul; that is not our business so accurately to enquire into; for that the Body must be fit to receive the Soul, and that if the Body undergo any material Change of its Temperament and Confirmation, presently the Soul takes its flight, as *Galen* acknowledges. But our Apprehension is not sufficiently perspicacious for us punctually to understand that precise time, which is only known to God the Creator of the Soul: and therefore says *Willis*, *When all things were rightly dispos'd for its reception, it was created immediately of God, and pour'd into the Body*: And therefore it is only for Philosophers to inquire into the Original of that same perishing Life in the body of Man, which is the Habitacle of the Rational Soul in this Vale of Misery for a Time; which Life, upon good grounds, we affirm to be far different from the Life of a Rational Soul, nor can arise from it.

The *second* Argument which I produce, is this; The *Rational Soul* is infus'd either into the Seed, or into the Birth when form'd. The first is not true, for then upon any effusion of fertile Seed, not follow'd by Conception, a Soul would be lost; and so all Divines would commit a heinous sin of public Soul-murder, in suffering young lusty Men to marry Women above Fifty, knowing there can be no Production from

from such unequal Matches. To which, if it be answer'd, That the Seed of the Man never proves fertile but when mix'd with the Seed of the Woman. I answer, That the efficient Power is all in the Man's Seed, and that the Womans Seed is only material, and the next Alimentary Principle. If therefore that efficient Power first forming the Birth, were the Rational Soul it self, it ought to be solely in the Man's Seed; and in that case the Divines and Law-givers could not exempt themselves from Soul-murder; from which however all Men readily excuse 'em, even those that hold the Soul to be propagated. If the *latter* be true, let the opposing Party tell us, what was the first Moving or efficient Cause in the Seed, which began to move and enliven the Seed before the Infusion of the Rational Soul. Of necessity it must be something else besides the Rational Soul, and therefore the Vegetative Soul. But Philosophers teach us, that in every living Compound there can be but one Soul, and that in Man comprehends the Vegetative within it self; and that the latter is only an Accident, and tempering of the Substance, that is to say, the innate Heat, and such a disposition of the Heart, Brains, and other Bowels, as also of the Spirits themselves, as is in a condition to act: and therefore there cannot be two distinct Souls in Man; one Vegetative, the other Rational. But tho' *Aristotle* of old, and many Philosophers now teach the same Doctrine, it is not to be thence inferr'd that the Doctrine is true: they are Men, and may Err. The foregoing Reasons sufficiently demonstrate the thing to be otherwise, and abundantly inform us, That the Life of the Body would be perpetual, if the Rational Soul were once to enliven it: For wherefore should it be less able to do it in the end, than at the beginning, when it can suffer no diminution of its Faculties? and if at the beginning it disposes the Matter for Life, why should it not proceed and do it without end? Moreover, seeing that a Vegetative Soul is admitted among Brutes as the only Mistress and Enliven-er of the Organical Body, wherefore may not such a Soul be admitted in the Body of Man, which is no less corruptible than the Body of the Beast? To this we may add, That the diversity of Actions, the necessity of two Souls in Man, is apparent: *For the Flesh covets against the Spirit, and the Spirit against the Flesh.* And this Intestine War every Man has Experience of in himself: For the Corporeal Soul abiding in the Body, inclines a Man to Sensual Pleasures; the Rational, which is of a higher Original, dehorts us to abstain from mischievous Lust, and invites us to Holiness, and raises our thoughts from things perishable and Earthy, to things Divine and Incorruptible. This Civil War *Medea* felt in her self, whence she cried out,

——Video meliora, proboque,
Deteriora sequor——

The better things I see and do approve;
The worse I follow after, seek, and love.

The Corporeal Soul makes Conclusions, and acts after its own manner, but far inferior to the Rational Soul.

LIX. *Lastly, The Corporeal Soul, tho' it not only apprehend Things in their simple Capacity, but laying several Things together, makes Conclusions after its own manner, as appears from the Actions of Dogs, Apes, Elephants,* &c. *yet are its Actions far inferiour to those of the Rational Soul.* For this not only beholds the Idea's conceiv'd by the Fancy of that Corporeal Soul, but also judges whether they are true or false, good or ill, disordered, or in order: and often stops the fury of the Corporeal Soul, unsteadfastly roving through various *Phantasms*, and recalling it from these or those Conceptions, directs it to others, and at its own pleasure bounds it within certain Limits, lest it should stray from the Truth, and by that means governs and moderates its Actions.

The Matter illustrated from Holy Scripture.

LX. *For the better illustration of this Mystery, there will some farther light appear in that which follows; tho' indeed the whole Cloud is dissolv'd by the Soveraign Judge, which is the Holy Scripture, which declares that there is a Vegetable Soul both in Men, as well as in Beasts.* Of Brutes, it is manifest in these words; *Let the Earth produce every living Creature according to its kind, Cattel, and Reptiles, and every Beast of the Field according to its kind.* And the same is to be deduc'd from *Gen. 9. v. 10, 12, 15, 16. Levit. 24. c. 18.* and *Job 12. v. 10.* in all which places the *Scripture* speaks of a Living Soul produced out of the Earth or Corporeal Matter, and joyned to the Living Body, therefore corruptible, and liable to perish upon the dissolution of the mix'd Body. And this sort of Soul in Men the sacred Scripture not only acknowledges, but distinguishes from the Immortal Rational Soul, calling he one simply,

simply, a *Living Soul*; the other the *Spirit given by God.* The first is apparent from several Texts of Scripture; *Gen.* 2. *v.* 7. *Exod.* 21. *v.* 23. *Levit.* 24. *v.* 18. *Deut.* 19. *v.* 21. 1 *Reg.* 19. *v.* 4. where *Elias* desired the death of his Soul. And in the Gospel of St. *John c.* 10. *v.* 11. *The good Shepherd lays down his Life for his Sheep.* Which certainly cannot be understood of the Immortal Rational Soul, which never dyes; but of that Soul which gives life, as well to Brutes as Men; and at the beginning form'd the Organic Body, and being it self Corporeal, is produced out of Corporeal Matter, and perishes again together with the Body which it form'd; and upon the perishing of which, the Rational Soul infus'd from above, immediately takes its flight, as not having any habitation in the body of Man longer than Life endures. This Immortal Rational Soul, the holy Text, to distinguish it from the Vegetative Soul, which is corruptible like the Matter from whence it proceeds, calls for the most part a Spirit, and sometimes only the Soul. Thus *David*, *Psalm* 15. *v.* 10. *Thou wilt not leave my Soul in the Grave.* And *Psalm* 30. *v.* 10. *Into thy hands I commend my Spirit.* Thus *Eccles.* 14. *v.* 17. *The Spirit returns to God that gave it.* Thus *Stephen*, *Acts* 7. *v.* 60. *Lord Jesus receive my Spirit.* And *Matth.* 27. *v.* 50. *And when he had cried with a loud voice he yielded up the Ghost*; repeated by St. *John*, *c.* 19. *v.* 13. All which latter Texts cannot be understood but only of the Immortal Soul.

An Answer to such as object that there cannot be two Souls in Man.

LXI. *But because it is apparent from what has been said, That there are two Souls in Man; what shall we answer to those that object, and say, there cannot be two Souls in Man, because several Forms cannot actuate the same Matter? We say that there is but one Soul that immediately actuates the same Matter, and gives Form to the Species, that is the Vegetative Soul; but that the Rational Soul, which is of a sublimer Original, only dwells in the Body, but never form'd it at the beginning.* So that there are not two, but only one Form that actuates the Matter. Which is manifest from hence; for that when the Body form'd perishes, the forming Form perishes likewise with it; but the Rational Soul neither perishes, nor is corrupted with it. Therefore this neither is, nor was the forming *Form*, but something else infus'd into the Body already form'd, and subsisting of it self, which by vertue of the forming Form abides in the Body; and when that fails, presently forsakes the Body, and subsists entirely of it self, without being united to it.

The sensitive Soul; what?

LXII. *But here another Question arises; Whether, if a Vegetative Soul be to be allow'd, which indifferently enlivens Plants and Animals, there be not also a third peculiar sensitive Soul to be allow'd, that feels as well in Man as in Beasts, and performs Operations different from those of the Vegetative Soul?* To which I answer; That the Vegetative Soul is the same that feels in those Creatures, which have those Mediums and apt Organs necessarily requir'd for feeling; as Brains, Eyes, Ears, *&c.* but where those Organs are wanting, as in Plants, they are not said to be sensible, but only to live as Vegetables.

We must therefore yield, according to Sacred Scripture, and for the Reasons already alledged, that there is in Man a Vital, Vegetable Mortal Soul, distinct from the rational immortal Soul; and that that is the Soul which is the chief Actress in the Formation of the Birth, the same also which many call the *Architectonic Power*, or the *Plastic Efficacy.*

The Architectonic or Vegetative Soul subsists in a Man with the Rational Soul.

LXIII. *And thus I think I have sufficiently demonstrated that the* Architectonic Power *is the Vegetative Soul it self, and that it may subsist in a living Man conveniently, together with the Rational Soul.* And now one would think there were no more to be said as to this Particular; but because we have already made an Excursion somewhat too far beyond the Limits of our Port, before we return back, let us spread our Sails, and steer a little farther into the Ocean, that we may shew a safer Course to others that sail in this Turbulent Sea, and are in continual danger of Shipwrack among the Shelves and Rocks of Error and Mistake.

The first Doubt that occurs in the History of the *Vegetative Soul*, is, where to assign it a Seat in the Body of Man, and other perfect Creatures; which has occasioned great Disputes among Philosophers.

The Seat of the Vegetable Soul, where?

LXIV. *That it abides in all Parts of the Living Body, scarce any one will deny, as being apparent from its actions in all parts of the Body. So that the Peripatetics asserting it to be equally diffus'd into all parts alike,*

say that it is in All, and All in every Part. That is to say, that one and the same Numerical Vegetable Soul extended through the whole Body enlivens the whole. But because it is divisible with the Matter wherein it abides; therefore that which abides in the Parts that are torn from the whole, not only constitutes a part of the Soul which enlivens the whole, but constitutes the whole Soul in that part so torn off; which either dyes with the part torn off, for want of Nourishment, as when any animal Part is cut off, for then all that whole Soul which enliven'd that part fails and fades away for want of Nourishment: Or else, having convenient Nourishment operates in the dismembred Part, and performs the Act of Enlivening. Which is apparent in many Plants; as for Example, of a Willow Bough, which being torn from the Tree, and again planted in the Earth, will grow as well as the Tree from which it was pull'd; and therefore every bough enjoys the whole Soul, as the Mother-Tree retains the whole Soul, and so both the one and other grow and increase alike, not by vertue of any part of the Soul, but of the whole Soul, as is apparent by the Action: For that Vivification and Nutrition is perform'd in all the boughs, which cannot be perform'd by a part of the Soul, but by all the Soul. And so the foresaid Maxim of the Peripatetics may be rightly expounded, which nevertheless has hitherto, by many Philosophers, been too hastily rejected as false and impossible.

Whether in some parts more than in others?

LXV. *Among those that have not rightly apprehended, the learned* Willis *seems to have been one, who in his* 4. Chap. de anim. Brutor. thus writes. *The Corporeal Soul*, says he, *in more perfect Brutes, and common to Man, is extended to the whole Organical Body, and vivifies, actuates, and irradiates both its several Parts and Humours, so that it seems to subsist in both of them actually, and to have as it were its imperial Seats. But the immediate Subjects of the Soul are the vital Liquor or the Blood, circulated by a perpetual Circulation of the Heart, Arteries, and Veins, and the animal Liquor or nervous Juice flowing gently within the Brain and its Appendixes. The Soul inhabits and graces with its Presence both these Provinces; but as it cannot be wholly together in both at once, it actuates them both as it were divided and by its Parts. For as one Part living within its Blood, is of a certain fiery Nature, being enkindled like a Flame. So the other being diffused through the animal Liquor, seems as it were Light, or the Rayes of Light flowing from that Flame.* And a little after,

There are therefore Corporeal Souls according to its two chief Functions in the Organical body; viz. *the Vital and the Animal*; *two distinct Parts, that is to say, the Flamy and the Lucid.*

Willis *not congruous in this matter to Reason.*

LXVI. *From this Text of* Willis *it appears, that the most famous Person conceived a new Opinion of the Soul, but less congruous to Reason.* For *First*, He alledges that the Soul, besides the Parts of the Body enlivens likewise the Humours and Spirits, wherein he very much deviates from the Truth. For that the Humours and Spirits do not live, but they would live were they enliven'd by a Soul. *Secondly*, Seeing that Life cannot be ascribed to the fluid Nourishments continually passing away, nor joyn'd to the whole in Continuity, but only to the real Parts of the Body: *Willis* seems tacitly to take it for a thing not to be question'd, that the Blood and animal Spirits are the true Parts of an animated Body, no less than the solid Parts adhering to the whole in Continuity, which that it is not true, we have demonstrated in the first Chapter of this Book. *Thirdly*, He asserts that the Blood and animal Spirits are the immediate Subjects of the Soul, the contrary to which is apparent, for that the immediate Subjects of the Soul are the Parts themselves of the Body, among which neither the Blood, nor Spirits, nor any other of the Humours are to be numbered. *Fourthly*, Contrary to Reason he constitutes two Parts of the Body, one Fierie or Flammeous, another Lucid, and ascribes to each particular Seats, to the one the Blood, to the other the animal Liquor; for thus the Soul that had no Feet before, will have two Feet in this our Age, and with one Foot shall tread upon the Blood, with the other upon the *animal Liquor*. Yet lest the Soul, having broken one Leg by Accident should chance to fall, provident Dr. *Willis* has provided her a third Leg. *But besides these two Members*, says he, *of the Soul, fitted to the individual Body, a certain other Portion of it, taken from both, and as it were the* Epitome *of the whole Soul, is placed apart, for the Conservation of its Species. This as it were an Appendix of the vital Flame, growing up in the Blood, is for the most part Lucid or Light, and consists*

of

of animal Spirits, which being collected into a certain little Bundle, and having got an appropriate Humour, are hidden up among the ſpermatic bodies. And thus the Soul that formerly knew neither how to walk or ſtand, now ſhall ſtand more firmly ſupported with three Leggs. And yet with all her three Leggs ſhe will halt, not without danger of falling, and therefore if any one could furniſh her with a fourth Leg, then ſhe would not only ſtand more ſtoutly, but proceed equally in all her Actions, without halting, like a ſtrong fourfooted Horſe. But ſetting the Jeſt aſide, it is apparent from what has been ſaid, that the learned *Willis* did not rightly underſtand the Maxim of the *Peripatetics*, and for that Reaſon miſerably mangl'd and divided the Soul, indiviſible ſo far as it abides in the whole, into ſeveral Parts at his own Pleaſure, whereas it is the ſame and of the ſame Nature in all the Parts. If any one ſhould here object, That the Seed is alſo potentially animated, and that from thence it is manifeſt, that the Humours may live and be animated as well as the Parts of the Body, which we have ſo ſtrenuouſly deny'd; I anſwer that the Seed is no nutritive Humour like the Blood, and animal Liquor, nor is any longer a part of the individual Body, *John*, or *Peter*, from whence it is ſeparated, but a ſpecific Juice, containing in it ſelf a Compendium of the whole Man, and the Ideas of all the Parts, and therefore the Soul may lie hid therein, as in all the Parts of the whole Body, till at length ſeparated from its Entanglements by Heat, it declares its being preſent by its enlivening Actions: Which enlivening Actions never proceed, nor can proceed, from any nutritive Humours, or redundant after Nouriſhment.

What the Vegetative Soul is?

LXVII. *But ſeeing the Philoſophers of our Age leave no Stone of Enquiry unturn'd, nor are ever at reſt, till they have found out ſomething in their moſt obſcure Searches, whereby to perſwade themſelves and others that they are within reach of the Truth. I would have them now explain to us what this vegetable Soul is, which is the firſt efficient and* Protoplaſtic *Principle in the Formation of the Birth:* For otherwiſe, if we were to acquieſce in the Name alone, the efficient Principle might be affirm'd to be rather a *Chimera* than an *efficient Principle.* If perhaps any one ſhall ſay with *Ariſtotle*, *That the Soul is the beginning of Motion.* Or, *That it is the firſt Act of a natural body potentially having Life.* Or with *Fernelius*, *That it is the Perfection of an Organic body, and whatever ſhall give Life to that body, and introduce vital Actions.* Or with *Sennertus*, *That it is an Act and ſubſtantial Form, by which ſuch a body is animated.* Or with ſome of our modern Philoſophers, *That it is the firſt matter of Fermentation and Formation, and that Life is nothing elſe but Fermentation*; Theſe are all meer Words and meer *Chimeras.* For by ſuch words the Eſſence of the Soul is no way unfolded: Nor does it appear, what that beginning of Motion, or what that firſt Act is; nor what that Perfection, or ſubſtantial Form, or firſt matter of Fermentation is. In Man alone we know the rational Soul, its Divinity, and its Immortality only by Revelation, and Faith, and by its wonderful and divine Operations. But no Man unfolds that ſubſtantial Form, that firſt Act, that firſt Matter of Fermentation, by which all animate Beings obtain Life, and are thence ſaid to live, nor what that firſt Act, that Form or Matter is; but all Men acquieſce in the Name alone of a *Vegetable Soul.*

This Soul is the vivific Spirit produced out of Corporeal Matter.

LXVIII. *This ſame Soul I call the vivific Spirit produced out of Corporeal Matter, ſurpaſſing all other Spirits produced out of Matter. Now altho' this Definition of mine be ſufficient to denote the Subſtance it ſelf of the Soul, or rather the Subject wherein it abides, nevertheleſs it will not ſatisfy many who deſire a farther Explication of the Nature of this Spirit, which however it is better to contemplate in Thought, than to expreſs in Words.* For how, or with what Knowledg inſtructed, it forms and joyns the Parts of the Body to be form'd, ſo fitly, and with ſo much decency of Order and Shape, he only knows who alone, and firſt of all created all things at the Beginning. What it is that rowſes it, and frees it from the Incumbrances wherewith it is ſurrounded, and brings it upon the Stage of Action, has been already ſufficiently explain'd; that is to ſay, the Heat acting in convenient place and time upon the Seed; for that without ſuch a Heat it cannot be diſſolved or waken'd out of the thicker Matter.

The Opinion of Regius.

LXIX. Regius *thinks he has found*

out a way to unfold this Gordian Riddle more clearly and after another manner promising to explain this obscure Mystery of Nature, as do many others, by manifest Reasons. He writes that the Formation of the Birth is perfected by the heat as well of the Womb as of the Seeds, by which their Particles are agitated in the Womb; and being agitated by reason of their Shapes and Magnitudes which they have acquired in the seminary Passages tempered and shap'd after a certain manner, of necessity become in the Womb a perfect prolific Principle of the Creature to be form'd, furnished with Alimentary Juice, and cloathed with little Membranes, in some Measure resembling the Seeds of Plants. Then he adds that this Explication of the Formation of the Birth is so manifest, that there is no farther Necessity of framing in the Womb or Seed any Idea, Fantasie, or Principle of a Soul or any other Faculty, to be the Author of Formation. But the most learn'd Gentleman, who at first sight promises something of a *Delphian* Oracle, in these words does but explain the lesser *Obscurity by the greater Obscurity*, and swelling with an extraordinary Self-Conceit, he is pleased with his own Invention, as to believe that never any Man ever did or ever will invent any thing more subtilly and ingeniously; when as there is nothing in it but Vanity and Ostentation. For what others call the Soul of the Seed, the vegetative Soul, the *Plastic* Power, the Architectonic Vertue, *&c.* that he calls certain Shapes and Magnitudes of the Particles of the Seeds, more difficult to be apprehended than plastic Power, or vegetative Soul. And altho' perhaps some Persons may believe that the Artificial Formation of other things without Life may in some Measure be conceived by his mechanic Explication annexed, yet does it not from thence appear, how the Parts of our living Body are generated out of the diversity of the Shapes and Magnitudes of the Particles of the Seed; what should occasion the Heart to be form'd in the middle of the *Breast*, and not in the *Abdomen* or *Head*, why there should be in that particularly eleven Valves and no more; wherefore not two Hearts in one Birth; how the Parts receive Life from the Principle of the Birth, and what introduces Motion and Actions, *&c.* All which, with an innumerable number of other things, he that will refer to the Shapes and Magnitudes of the Particles of the Seed, ought first to tell us what they are, and how they are mixed. Who does not this, proposes his Shapes and Figures as meer Imaginary *Chimeras*, and clears up no Obscurity, but wraps us up in more Darkness, and while he pretends to tell us something of Novelty and better, says nothing at all, but intangles an obscure thing in newer but obscurer Terms.

Willis's Opinion.

LXX. *Lately* Tho. Willis *has set forth the Substance and Nature of this Soul quite otherwise,* de an. Brut. c. 2. *Where after he has asserted the Soul of Brutes, which we call Vegetative to be Corporeal, and extended through the whole Body, and divisible together with the Matter wherein it abides, at length concludes, that the Soul lying hid in the Blood or Vital Liquor, is either a certain Fire or Flame.*

But that we have affirm'd the Soul of a brute, says he, *to be not only Corporeal and extended, but that it is of a certain fiery Nature, and its Act or Substance is either a Flame or a breath, near to, or a Kin to Flame, besides the large Testimonies of Authors both Ancient and Modern, Reasons and Arguments almost demonstrative, have also induc'd me to it. As to what appertains to the Suffrages of others, that I may not seem to insist upon the Authority of a single* Gassendus, *who has maintained this Hypothesis, I shall here cite many both ancient Philosophers and Physicians. For not to mention* Democritus, Epicurus, Laertius, Lucretius, *and their Followers,* Hippocrates, Plato, Pythagoras; Aristotle, Galen, *with many others, tho' disagreeing about other things: Yet in this Opinion, That the Soul was either a Fire, or something Analogical to it, they all shook Hands; to whom, among the Moderns,* Fernelius, Heurnius, Cartesius, Hogeland, *and others also have joyn'd themselves; and lately* Honoratus Faber *has delivered in expres Words, That the Soul of the brute is Corporeal, and its Substance Fire.*

Willis Refuted.

LXXI. *But while the famous* Thomas Willis, *with all those most ingenious Philosophers and Physicians, asserts the Soul to be Fire, he names indeed a Body of the greatest Activity, but such a one as consumes and destroys*

destroys all things in which and upon which it acts: whereas the Soul by its Presence does not destroy those Bodies in which it is and acts, but preserves 'em in their soundnss, excites the Members to their Functions, and defends 'em from Corruption, till those Bodies, wherein it abides, are destroy'd by some other Cause, together with the Soul it self. Moreover, among all those famous men, not one could ever teach, what it is that forces or instructs that Fire in the Generation of the Creature to adapt and joyn all and singular the parts in such an exact and admirable order together, and in every one to perform such various and determin'd Operations; *as the making the* Chylus *in the Stomach, Blood in the Heart, Animal Spirits in the Brain, Sight in the Eye, Hearing in the Ear, Taste in the Tongue:* why through its extraordinary activity and rapid Motion, it does not hinder the Formation of the Organs, and rather destroy 'em being form'd, then form 'em it self, and produce variety of Actions out of each.

Willis *his Explanation of the Soul.*

LXXII. *Moreover, the foresaid* Thomas Willis, *pretending to explain the Soul yet more perspicuously, defines it a little after to be a Heap of contiguous Particles existing in a swift Motion.* And then to shew the nature and original of those Particles, he thus proceeds, *Cap.* 4. *In Mechanical things, Fire, Air, and Light are chiefly energetical, which human Industry is always wont to use, for the more stupendious and no less necessary Works. In like manner we may believe, that the supream Work-master, to wit, the Great Creator, in the beginning did make the greatly active, and most subtile Souls of living Creatures out of their Particles, as the most active, to which he also gave a greater, and as it were a supernatural Virtue and Efficacy from the most excellent Structure of the Organs, most exquisitely labour'd beyond the Workmanship of any other Machine.*

The Authors Animadversions.

LXXIII. *But suppose the Substance of the Organ, wherein the Soul most nearly resides to be made out of such Principles, and so the Organ of the Soul to be well compos'd, what is this to our Enquiry? The true Existence of the Soul consists not in the Substance of the Organ, but in its own Substance, and appears by its Act or Operation.* As the sight consists not in an Eye well compos'd of good Substance, but in the Act of Seeing, and perception of the visible Rayes; which Act of Sight the Soul accomplishes by means of the Organ of Sight well form'd. But now I would fain know what that is which gives life to that heap of Particles, constituting the substance of the Soul, and by its Presence forms and enlivens the other Parts, and excites 'em to so many various, wonderful, and distinct Operations? when it is said that the Soul is a heap of most subtile Particles, or a Fire, then only by an impropriety of Speech, the *Thing containing* is designed for the *Thing contained*; that is, some most subtile Subject wherein the Soul most nearly resides. For that properly it is something else besides Fire, is apparent from the contrariety of the Actions: For the Fire destroys, the Soul preserves: the Fire destroys Bodies form'd; the Soul both forms and produces things not form'd. The Fire is sensible of nothing; the Soul by means of the sensitive Organs, sees, hears, and tasts, *&c.* Hence the most learned *Willis*, tho' a most stout Asserter of his own Opinion, at length is forced to distinguish the Soul from its Corporeal Subject: *For,* says he, *as soon as any Matter is dispos'd to receive Life, by the Laws of the Creation, the Soul, which is the form of the thing, and the Body, which is said to be the Matter, began to be form'd under a certain Species, according to the Character imprinted in 'em.*

The form of the Soul is different from the Matter it inhabits.

LXXIV. *Therefore the Form, that is the Soul, is something different from that same Matter, which is the next Subject or* Habitaculum *of the Soul.* In like manner, speaking of the Principles of the Soul, *As to the first beginnings of the Corporeal Soul,* says he, *this, as a Shell-fish, forms and fits its Shell to it self, exists somewhat a little sooner, and so more noble than the Organical Body: Because a certain portion of Animal Spirits, or most subtile Animals, or a little Soul not yet inkindled, lyes hid in the Seminal Humour, which having gotten a proper fire place, and at length being kindled from the Soul of the Parent acting or leaning to it, as a flame from a flame, begins to shine forth and unfold it self, a little before the first Groundwork of the Body is laid. This orders the Web of the Conception, and agitates the apply'd Matter, &c.*

Willis *his little diminutive Soul.*

LXXV. *Now I would have Dr.* Thomas Willis *explain what he means by that* Little Diminutive Soul not yet

yet enkindled. *For a heap of Animal Spirits, or any Atoms whatever, can be nothing but the nearest Matter wherein it abides: For such a Subject does not live, unless there be in it some living thing to enliven that heap. For such a Subject, in Generation, neither knows how, or was ever taught to form, delineate, compose, and enlarge all the Parts in such exact order.* Which what it is we know not, only we find it by its effects. Hence *Willis* himself acknowledges, *that the Soul cannot be perceived by our Senses, but only we understand it by its effects and operations.* From which words of his it appears, that whatever Dr. *Willis* said before of *Fire*, and a *heap of Animal Spirits* and *Atoms*, they are only meer and most uncertain Conjectures, which denote not the Soul it self, but only either its next Subject, wherein it abides, or by a Similitude of thinnest Body of swiftest Action, the manner, in some measure, of their Actions. For to assert that the Soul is a Heap of most subtile Atoms, or a Fire, is the same as to assert, that the Sight is Fire, because that by the means of the most subtile moveable Fire, its Action is accomplish'd, nor can be accomplish'd without it. Whereas it is not that same *Medium* into which the visible Rays are imprinted as the Subject, and with it conveigh'd to the Eyes, but the perception of those Rays that make the sight. As therefore that Percipient is something else quite different from the Air, by means of which the visible Rays are convey'd to the visible Organs: So the Soul is somewhat else, which is different from the Fire, or any other heap of Atoms, by means of which it subsists and operates in the Body.

Willis *his Absurdity.*

LXXVI. *From whence it is apparent how absurd that is, which Dr.* Willis *adds, Cap.* 2. The Existency of the Corporeal Soul depends altogether upon its Act or Life. *The word* depends *is ill; he should have rather said,* becomes known. *For by the Act it self, or Life, we only discover, that such a Soul is present and acts, to enliven the Body wherein it abides.* For Example; when I write any thing, by that Act it is known that the hand of a writer performs that Act: However, the Hand that writes is quite different from the Act, which is the writing; and does not altogether depend upon that Act; only by that Act the presence of the *Agent* is made known. Wherefore it is not well added by Dr. *Willis*, *The Essence of this begins altogether from Life, as it were from the firing of a subtile Matter.* I say he asserts this erroneously, for that the Soul does not begin from Life, which nevertheless lies as it were imprisoned in the Seed, till with its spirituous Subject, wherein it resides, it remains wrapt up in the thicker Particles of the Seed; from whence being set at liberty in a convenient place by the Heat, it begins to act and perform its duty, and enliven, form, nourish, and increase the Body where it resides; and thus by these actions we discover, that such an enlivening Soul is in the Body.

The Affections or Passions of the Soul.

LXXVII. *Of the Affections or Passions of this Soul many things might be written, which however we purposely omit, lest our Digression should be too tedious.* In the mean while we recommend to the Readers what the learned *Willis* propounds upon this Subject in his *Hist. de Anim. Brut.* from *Cap.* 8. to *Cap.* 16. where he writes so elegantly and splendidly concerning the Passions, that he does not only shew the sharpness of his Wit, but carries away the Laurel from all others that have wrote before him.

Whether the Soul be nourish'd.

LXXVIII. *We shall only add one Question more, Seeing that the Vegetative Soul is Corporeal, whether it be nourish'd by those Nourishments which are brought for the support of the Body wherein it abides?* It was an ancient saying of *Hippocrates*, That the Soul always grows till death. Hence some have concluded that the Soul wasts like all the other parts of the Body, and is repair'd from time to time by the Nourishment, together with those Parts wherein it resides. But seeing the Nature of the Substance of that Soul is unknown to us, and for that reason in the mean time teaches us, that it abides in some Subject which is the neareſt, as in some subtile Spirit, and by that means enlivens the Body, we think that same saying of *Hippocrates* is rather to be understood of that same neareſt subject of the Soul, without which most certainly it cannot subsist, than of the Soul it self; concerning whose substance, what, and of what Nature it is, and whether it want Nourishment, we can determine nothing certainly. When the flame of a Lamp is cherish'd and continued, we do not nourish it with a flame like to it self, but something that nourishes

nouriſhes the Subject to which it adheres, as Oyl with Oyl; which Subject failing at length, the flame fails, which however is ſomewhat diſtinct from it ſubject, for Oyl is not flame or fire; neither is Fire Oyl. But it is a diminutive Fire latent in the Oyl, which being kindled by another flame, iſſues forth out of it by degrees, but cannot ſubſiſt without it, and ſo there is a neceſſity of recruiting, not the flame of the Lamp with another flame, but the ſubject of it, that is the Oyl, to the end it may be continued. In like manner 'tis not the Soul, but its neareſt Subject, which is to be nouriſh'd, and ſo by the nouriſhment of that the Soul is continu'd. But that Dr. *Willis* believes the contrary is apparent from theſe words of his: *As the thicker Particles of the Nutritive Juice repair the loſſes of the Corporeal Bulk, ſo the more ſubtile Particles of it repair the waſte of this ſame Soul.* And thus he believes, that not only the near Subject, but the Soul it ſelf to be nouriſh'd: which is left to every Man's *liberty* to think what he pleaſes.

What this Life or Soul is, the Philoſophers ignorant.

LXXIX. *In the mean while there are ſuch eager Contentions about the Original, Seat, Subject, Eſſence, Subſtance, and the whole Hiſtory of the Soul, the moſt acute Philoſophers, could never yet find out and tell us what this ſame Life or Soul is, concerning which ſo much has been diſcours'd and written, and which is the prime Actreſs in the Generation of all Creatures, and forms the whole that is to be form'd.* Here therefore it is that we are all at a loſs; here we find how ignorant we are, here we perceive how vainly we waſte our time, in prying into thoſe Myſteries which the moſt Sublime Creator would not have us underſtand: Here we obſerve the Arrogancy of many, who in the unfolding ſuch Secrets of Nature, with a haughty Oſtentation endeavour to ſhew their Knowledge and their Learning, when they utter nothing but meer empty words. Certainly it behoves us in Myſteries of this Nature tacitly to acquieſce, and patiently to be contented with our Ignorance, and rather to admire the Power of the Almighty, than to be too ſcrutinous into forbidden Myſteries, mindful of thoſe Verſes of *Lucretius*:

Multa ſacro tegit involucro Natura: neque ullis
Fas eſt ſcire quidem mortalibus omnia: multa
Admirare modò, necnon venerare: neque illa
Inquires quæ ſunt, arcanis proxima: namque
In manibus quæ ſunt, vix nos ea ſcire putandum eſt.
Uſque adeo procul à nobis præſentia veri.

The Senſe of which is this:

Nature, much under Vails ſeems to conceal,
Nor was it fit, ſhe all things ſhould reveal.
It is not juſt, proud, fooliſh Man ſhould know
All things ſhe does within the Orbs below.
Nor is it fit Man ſhould be made ſo wiſe:
Leſt knowing all, he ſhould her Skill deſpiſe.
Some of her Works as wonderful ſhe made;
And ſome, the worſhip of the Gods invade.
Things near, if hid, we may not ſearch into:
The more remote, leſs lawful are to know.
Thoſe things with which we daily do converſe,
Their very Names we ſcarcely may rehearſe.
So far off ſtill, Truths preſence ſeems to ſtand,
We ſcarce the Name, much leſs the Thing command.

CHAP. XXX.

Containing the Hiſtory of the Birth contained in the Womb. And firſt of the Placenta *or Uterine Liver, and the Cavities call'd* Acetables.

HAving thus finiſh'd the Hiſtory of the Seed and Conception, together with that of the Formation of the Birth; now let us proceed to the Hiſtory of the Birth when form'd, and contain'd in the Womb.

The Uterine Liver.

I. *Upon opening the Womb of a Big-bellied Woman, there preſently appears a fleſhie Subſtance, which* Fallopius *from ſome reſemblance which it has*

has to a Cheescake, calls the Uterine Cheescake, *or* Placenta; *others from its resemblance in use, colour, and substance, call it the* Uterine Liver.

The Definition.

II. *This Liver is a Bowel after its own manner fleshie, soft, consisting of innumerable Fibres and small little Vessels, and Blood between, condens'd in dead People, by means whereof the Birth adheres to the Womb, but more especially to the bottom of it.*

Its Original.

III. *At first the Seed of the Man being injected into the Womb (if Conception happen) is every way enclos'd by the whole Circumference of the Womb, and is found contiguous to it. Then by the nourishing heat of the Womb it is melted and dissolv'd, and so the prolific spirituous part being separated out of it, it retires forthwith through the* Uterine Tubes *toward the* Ovaries, *there to imprint upon the ripe Egg the Seal of Fertility.* This Egg in the Ovary is surrounded with two little Pellicles, of which the one is thicker and stronger; the other thinner and weaker, as in Birds an outermost hard shell, and an inner thin Membrane grows in the Egg out of the Seed of the Hen. To the outermost of these Membranes, at the very first beginning certain downy Lineaments form'd out of the Female Seed are seen to adhere: to which also, at the very same first beginning, a certain ruddy soft substance joyns it self, which seems to arise from the substance it self of the womb, in the same place where the Egg slips through the Tube into the Womb, by means whereof it adheres by and by to the Womb, and is furnish'd by the Womb with some Blood-conveighing Vessels, which it imparts to the *Chorion*, as being those Vessels which are discern'd in the *Chorion*, before any Formation of the Birth, nor can be derived thence from any other part. These downy beginnings of the *Placenta*, or Uterine Liver, increase by little and little through the affusion of that same Blood to this very Bowel, whose substance at the end of the third Month is notably conspicuous. Within the inner Membrane is included the whole Colliquation of the Seed, together with the Crystalline Bubble, wherein the Birth is form'd out of the prolific Principle infus'd into it; which being form'd swims upon the Colliquation, free and adhering no where to any Membranes, and for some time is nourish'd with that alone.

When the Umbilical Vessels begin to grow.

IV. *Afterwards, when the increasing* Embryo *begins to want a more plentiful Nourishment, the Extremities of the Umbilical Vessels grow out more and more, and are extended toward this Liver (which from that time begins to be more manifestly conspicuous, to the end they may draw a firmer Alimentary Juice from thence, and carry it to the Birth, as the Plants by means of their Roots suck nutritive Juice from the Earth.* But how these Vessels cross the Membranes, and come to this Liver, see *Chap.* 32.

Harvey's *Observations of the beginning of the* Placenta *in an Abortive.*

V. Harvey, *in an Abortion cast forth about the bigness of a Hen-egg, observ'd withal in the outward and upper part of the* Chorion, *as it were a thin Slime, or a certain Down, denoting the first Rudiments of the growing* Placenta; *and in the inner part of the same several Roots and Branches of the* Umbilical Vessels, *but never the* Chorion *sticking to the womb.* But the reason why he never saw the *Chorion* sticking to the womb, perhaps might be, either because the Matter to be pour'd forth out of the womb for the increase of the *Placenta*, was not yet increas'd to a sufficient quantity; or because the fleshie Particle, which we have seen sticking to the *Chorion*, in the Expulsion of that Conception, was not torn from the womb, but from the *Chorion*; and so the *Chorion* coming forth together with it, was not by *Harvey* seen to stick to the womb. But those Roots of the Vessels which *Harvey* took for the *Umbilical Productions*, seem not to have been the little Branches of the *Umbilical Vessels*, in regard the Navel could not be grown out to that length in that time, nor reach so far, but were rather little Vessels extending themselves from that same fleshie substance sticking above to the *Chorion*, with which the Umbilical Vessels are wont to intermix themselves. See the Abortions in the preceding Chapter.

Whether coagulated Blood?

VI. *By what has been said, it is sufficiently apparent, that the beginning of the* Placenta, *or Uterine Liver, is not generated out of the impurer part of the menstruous Blood flowing from the womb, the more pure part in the mean season passing to the Birth through the* Umbilical Vein, *(as many have erroneously asserted:) seeing that*

that the first threads of it are delineated out of the Womans Seed as well as the Chorion *and* Amnion; *to which afterwards the nourishment is brought, not from the more impure, but from good Blood pouring in.* And therefore they were grosly mistaken, who judg'd it not to be any Bowel, but only a heap of menstruous Blood collected and coagulated without the Vessels, and preserv'd in that place for the nourishment of the Birth, whereas both in respect of its beginning, its fibrous substance, and its use, it appears no less to be a Bowel than the other Liver seated in the right *Hypochondrion.* Besides that, the upholders of this Opinion do not consider, that the Blood cannot subsist without Corruption nine Months together out of the Vessels in the womb, or any other hot and moist place; and daily Experience teaches us, what terrible Mischiefs follow upon the Extravasation of the Blood tho' it be good, if it stay in the place but a few Months.

Aquapendent's *Opinion.*

VII. Fabricius ab Aquapendente *calls this Liver a* Fleshie Substance, *and a* Fleshie Mole; *not that it is simply flesh, but a Bowel that has a peculiar and proper fibrous Contexture, and a flesh convenient for it self, whose first threads are delineated out of the Womans Seed; and afterwards a peculiar fleshie Substance thicken'd out of the Vital Blood, which first flows from the Mother more plentifully thither through the Uterine Vessels, and afterwards is forc'd thither from the Heart of the Birth through the Umbilical Arteries.* For when the Umbilical Vessels are come to the Uterine Liver, a certain spirituous Nectar, or Vital Spirit, flows out together with Arterious Blood from the heart of the Birth, which as it increases, nourishes, enlivens, and excites to action all the Parts of the Birth, and its Membranes, the spirituous Blood of the Mother assisting and affording the greatest part of the Matter, so does it enlarge and nourish this *Placenta* or *Uterine Liver.*

The number of Placenta's.

VIII. *This Liver in a single Conception is alway single; and in the Conception of Twins, both Births have one common Liver containing the Navels of both; but sometimes each Birth has a distinct and proper Uterine Liver.* However, *Wharton* believes that both Twins have a peculiar *Placenta*, but so contiguous, that they seem to be but one. But that the Opinion of *Wharton* express'd by the word *always*, is not generally true, Experience teaches us; by which it appears, that sometimes the contrary happens. And therefore we are certainly to conclude, That in the Conception of Twins there is sometimes one *Liver*, sometimes two. But for what reason, and in what cases there happens sometimes one, and sometimes two, is a Mystery hitherto unreveal'd, and unknown to all Practisers; which nevertheless we shall endeavour to unfold in the next Chapter, when we come to discourse of the *State of the Membranes in Twins.*

Its Substance.

IX. *The Substance of it is peculiar to it self, soft, loose, brittle, thin, furrow'd with several furrows, and as it were here and there slightly divided; yet in the mean time altogether fibrous, being a Contexture of innumerable Threads and diminutive Fibres, and infinite little Branches of diminutive Vessels, and swelling with coagulated Blood pour'd in, not much unlike the looser* Parenchyma *of the Liver, tho' less firm, and easily dissolv'd and mangled by a slight attrition.* And such a sort of Substance, as well at other times, as particularly in *December* 1665. we shewed to several Doctors of Physic and Students, in a Woman that dy'd after she had been six Months gone. And lately in the *Placenta*'s of two live Women, from whom we extracted the Births when they could not be deliver'd of themselves: which *Placenta*'s, after the Extraction of the Birth, were separated whole from the Womb, and drawn forth together with the Membranes.

Its Colour.

X. *It is of a dark ruddy Colour, not unlike the Colour of the Spleen; somewhat more ruddy, seldom paler.*

Shape and bigness.

XI. *The Shape of the whole Uterine Liver is for the most part Circular, sometimes Long, or Quadrangular, seldom Triangular; but unequal in its Circumference. But the bigness and thickness various, according to the Condition of the Body and the Birth, and the Time of the Womans going.* For in Abortions of thirty and forty Days it hardly appears about the Roots of the Navel, hardly then extended thither. But after that the spirituous

Blood flowing thither in greater Quantity, it grows and enlarges every day, till at length it comes to its Perfection, about a Foot in Breadth, or so much as may be extended between the two Thumbs and fore-Fingers extended in Compass: About two or three Fingers thick in the Middle, but thinner in the Extremities. *Nicolaus Hoboken*, an accurate Inspector into these *Placenta's*, writes that he never saw any one thicker than a Thumbs breadth, or very little more. Nevertheless we are to observe that there is some variety in the breadth and thickness, being found sometimes to be thicker, and sometimes thinner in all Secundines.

The Superficies. XII. *In the hollow Part next the Birth, the Superficies of it is equal and concave like a small Platter. Upon the gibbous Side unequal with several Excrescencies, with which it fastens it self to the inside of the Womb, no other Substance interceeding, the fungous or spungy parts here and there slightly swelling out at the time of Impregnation, and rests upon it with its open Pores.* And the Womb also, at that time more spungy, opening its Pores and the Extremities of its Arteries, joyns immediately to the *Placenta*, yet without any mutual *Anastomoses* of the Veins or Arteries either of the one or the other (concerning which several Anatomists have written several Fancies contrary to Truth, meerly upon the Score of Conjecture) and so it transfuses the Alimentary Blood and milky Juice into this *Placenta*, which after Delivery, the said *Placenta* being torn away and separated, for many days together flows from those Openings or little Holes.

The Ingress of the Navel. XIII. *In the Middle, or about the Middle, and sometimes toward one or the other Side a diminutive little umbilical Gut is fasten'd to it, with its Vessels included, by means whereof there is a necessary Communication between the* Placenta, *and the Birth; of which more* c. 32.

Its Vessels. XIV. *A Vein, and two umbilical Arteries are inserted into it, which are intermix'd with Roots in the Substance of it, with a wonderful Folding, and are thought to joyn together with some Anastomoses. But the Ramifications of the Arteries are generally more numerous, more serpentine and knotty, but less and more ruddy: The Ramifications of the Vein less in number, but larger and thicker, less contorted, and of a darker Colour.* However the bigger part of the Roots is not joyn'd by *Anastomoses*; but the Arteries pour forth the Blood which is brought from the Heart of the Birth into the *Parenchyma* of the *Placenta*; which together with a good part of the Blood flowing through the small Vessels of the Womb, being altered by the Uterine Liver, and endu'd with a slight fermentaceous Quality, the gaping Roots of the Vein assume and convey to the Birth.

Whether any Anastomoses between the Vessels of the Womb and Cheesecake. XV. *It has been the common Opinion, according to the Sentence of* Galen, *That the diminutive Branches of these small Arteries and Veins are not only joyn'd together by* Anastomoses *between themselves, but also with the Extremities of the Vessels of the Womb; and hence, after Delivery, by their being broken off from the falling Uterine Liver, there happens a great Flux of Blood.* But we observe in Brutes, That certain Vessels attracting Nourishment out of the little *Placenta's* of the *Chorion*, are manifestly extended into the Pores of the little pieces of Flesh swelling out from the Womb, but that no *Anastomoses* descend from the Womb or its Protuberances into the *Placentulæ* of the *Chorion*, nor that there are any *Placentulæ* between the Vessels of these *Placentulæ* and the Womb. Which it is probable to be no less true in human Conception, and that no blood-bearing Vessels run out from the Womb into the *Placenta*, but less that they joyn together by *Anastomoses* with the *Umbilicals*; seeing that the blood descends like Dew, only by degrees from the Ends of the Uterine Arteries, gaping at the time of the womans being ingravidated, where it is prepared for the Nourishment of the Birth, as we shall shew hereafter.

Wharton's *Opinion.* XVI. Wharton *seems to assert, that several* Vasa Sanguifera *are extended from the Womb it self no less than from the Navel of the Birth, into the* Placenta, *however that they are intermix'd with 'em. For he says that the* Placenta *is divided into two Halves, easily separable one from the other. Of which two Halves, the one manifestly looks toward the parts*

parts of the Womb, and the other towards the parts of the Embryo. And that all the Uterine Veſſels, diſtributed toward the *Placenta*, terminate in that ſame half which looks toward the womb, and there are conſumed into little hairy Strings, and do not at all paſs thorough the other half. Alſo that the umbilical Veſſels which run forward toward that half of the *Placenta* which is fixed to the *Chorion*, are all exhauſted into ſmall Hair in the ſame half; neither do they paſs into the oppoſite Medietie contiguous to the womb. But this moſt famous Perſon preſuppoſes a Diviſion of the *Placenta*, never to be found, and never demonſtrable; and thence erroneouſly concludes, that the diminutive Veſſels running from one place to another, reach no farther than the one half; whereas there are no *Vaſa Sanguifera* that deſcend from the womb to the *Placenta*, and for that it is moſt certain that the umbilical Veſſels penetrate through the whole. But as for thoſe diminutive Veſſels that are derived from the little piece of Fleſh affixed to the *Chorion* at the beginning of the Conception, they are diſtributed through the whole *Chorion*, before the Formation of the Birth, and ſeem to have none or very little Communication with the *Placenta*: Concerning which, 'tis very much to be doubted whether they proceed from any Continuation of the Veſſels of the womb. To which Obſcurity the moſt accurate Inſpection of the famous *Nicolaus Hoboken*, have given us a very great Light, who never could obſerve any Productions of the blood-bearing Veſſels from the womb into the *Placenta*, whenas he has inquir'd into, and laid open, with great Study and Induſtry above other men, all the Myſteries of the *Placenta* and the whole *Secundine*; publiſhed in a Treatiſe, *de Secundin. Human.* adorn'd with Cuts delineated with his own Hand, and expoſed to the View and Judgment of all Men.

Whether any Veins and Arteries in the Cheeſcake?

XVII. *The ſame* Wharton *believes, that there are alſo lymphatic Veſſels intermix'd with the Veins and Arteries in the uterine Liver, and that then enters together with them the Navel of the Birth. But he adds, that thorough thoſe the milkie Juice poured forth from the Womb toward the* Placenta, *is conveighed to the Birth.* But we have prov'd it already that there are no ſuch conſpicuous Veſſels extended from the Womb to the Birth; and that if *Wharton* by accident ſaw any little whitiſh Veſſels carried from the *Placenta* to the Womb, through the umbilical diminutive Gut, 'tis very probable he might be deceived and miſtake the milkie Veſſels for Lymphatics; as differing very little either in ſhape or thinneſs. Unleſs we ſhould ſay, that the lymphatic Veſſels do not only and always carry the *Lymphatic Juice*, but the *Chylus* alſo in various places, where the *Chylus* is offered, and ſo that the ſame thing may likewiſe happen in the *Placenta*, as it often happens in that large pectoral Veſſel, called the *Thoracick Chyliductus*. In the mean time *Hoboken*, a moſt accurate obſerver of theſe things never could find any lymphatic Veſſels in the Liver, neither did they ever occur to me, tho' I have diligently ſought after them.

Whether any Nerves in the Cheeſcake?

XVIII. *Some there are who aſſert, that there are alſo certain ſmall diminutive Nerves, and that there is a certain nutritive Juice conveighed through thoſe for the benefit of the Birth. But I would fain know of thoſe People, whence thoſe Nerves have their Original, from the Father or the Mother, or from the Birth?* The firſt cannot be, by what we have ſaid already, in regard there are no Veſſels that extend themſelves out of the *Placenta* into the Womb. And that the latter cannot be true, is apparent from hence, becauſe it is contrary to Reaſon and all Belief, that any Nerves ſhould be extended ſo far from the moſt ſoft Subſtance of the brain of the birth, and that they ſhould run from the body of the Womb it ſelf, through the whole length of the Navel to the *Placenta*: Beſides that in the Delivery, by the breaking of thoſe Nerves the birth it ſelf would be greatly endangered. *Laſtly*, Becauſe there are no nutritious Juices carried through the Nerves, neither can be carried through 'em, as we ſhall ſhew more at large *l.* 8. *c.* 1.

We have ſaid a little before, that the Veſſels and Pores of the Womb, do gape a little toward the *Placenta*, and empty their Juices into it like a kind of Dew. This many ſtrenuouſly deny in Women: And yet at the ſame time they grant that the Veſſels of the Womb are opened into the Uterine Caruncles of Beaſts, and pour forth their alimentary Juice into their little Caverns, which is again ſuck'd up out of them by the

little branches of the umbilical Veſſels, and out of thoſe Cotyledons is carried to the Womb, as we find true by ocular Teſtimony. But it is not worth while to uſe many words in refuting the Opinion of theſe Men, as contradicting not only the Sight it ſelf, but one another, ſeeing that they allow alimentary Juice to the *Placenta's* or *Cotyledons* of Beaſts, and yet deny them to the *Placenta's* in Women; whereas there is the ſame uſe and neceſſity of the ſame part in both, and for that it is apparent by what has been already ſaid that the alimentary Juice is no leſs in the *Cotyledons* of Women than of Beaſts.

The Place of Adheſion.

XIX. *The Place where the* Placenta *ſticks to the Womb cannot be certainly aſſign'd; for ſometimes it is joyn'd and firmly adheres to it in the right ſide, ſometimes in the left, and ſometimes at the hinder part of the bottom of the Womb; and where it is faſtened within to the* Chorion, *there it admits the Entrance of the umbilical Veſſels.* But when it begins to increaſe, in the firſt Months it ſticks as cloſely to it, as the unripe Fruit to the Tree. But the bigger the Birth grows, and the nearer to Delivery, ſo it ſtill parts the more eaſily from the Womb, and at length, when the Fruit is quite ripe, after the Expulſion of the birth, falls off from the Womb.

The Opinions of the Ancients.

XX. *By the general Vogue of the Ancients it is ſaid to adhere to the Womb by* Acetables, *concerning which* Acetables *however there is a very great diſpute.*

Opinion.

1. Some think 'em to be the Protuberancies of the Veſſels of the womb, like to Hemorrhoids or Warts, with which the *Embryo* is nouriſh'd. But this is derided by *Erotian* in his *Onomaſticon*.

2. Others with *Diocles* aſſert 'em to be certain *Mamillary Proceſſes*, ſwelling out from the body of the womb into its Cavity, during the time of Ingravidation, for the Nouriſhment of the Birth: which is alſo exploded by *Soranus Epheſius*.

3. Others with *Protagoras*, back'd as they ſay, by *Hippocrates* and *Galen*, affirm that the *Acetables* are the Orifices of the Veſſels ſwelling with overplus of blood, diſperſed through the inner Tunicle of the Womb? And thus *Van Horn* aſſerts 'em to be a certain arterious larger ſort of little Pipes gaping into the Cavity of the Womb. Which Opinion was ſtarted long before by *Spigelius*, but rejected by *Nicolas Maſſa*.

4. Formerly they held that the Kernelly Pieces of Fleſh, reſembling the Leaves of the Herb *Wall-Penny-Wort*, were placed between the *Chorion* and the Womb, adjoyn'd to the Orifices of the Veſſels, and took them for the *Cotyledons*.

5. *Riolanus* writes that the *Placenta* is faſtened to the ſides of the Womb by an innumerable number of Fibrous Productions, and gives the Name of *Cotyledons* to theſe Fibres: And beſides theſe affirms that there are no other apparent *Cotyledons* in Women.

6 *Fallopius*, *Arantius*, and many other quick-ſighted Anatomiſts, deny that there are any *Acetables* or *Cotyledons* in a womans Womb; with whom alſo *Harvey* agrees: who deſcribes the *Cotyledons* in beaſts, but deny women to have any, or that they have any thing like 'em. On the other ſide *Silvius* ſtoutly maintains that there are *Acetables* in women, and affirms that they are to be ſeen in a woman near her Time, or but newly delivered. With whom *Carolus Gemma*, and *Laurentius* agree, *Galen* indeed aſſerts that women have *Cotyledons*, but he confirms it only by the Authority of other Anatomiſts; and ſays they are the Orifices of the Veſſels of the Womb; or rather the cloſing together of the Veſſels of the womb and the birth by *Anaſtomoſis*: Which Opinion we have already refuted.

In ſuch a Diſſention of learned Men, tho' it be hard to aſſert any thing of certainty, yet the Truth is to be inquired into, in regard it ſeems a thing not to be doubted, but that women have *Acetables*, in regard that *Hippocrates*, who neither could deceive nor be deceived, as *Macrobius* teſtifies, makes mention of 'em; which he would not do to no purpoſe nor by miſtake. Firſt then let us conſider what theſe *Cotyledons* are, and next, whether they are in women with Child?

The Name deriv'd.

XXI. *Certain Parts appearing in the Womb of a woman with Child, are called by the Greeks* Κοτυλεδονες, *and that from a two fold Reſemblance. Firſt from the Likeneſs which they have to the Herb* Cotyledon, *which the Latins call* Venus-Navel, *in Engliſh* Wall-Pennywort, *an Herb, whoſe Leaves are ſomewhat thick, ſmooth, full of Juice, round, unequal in Compaſs, and a little hollow in the*

the middle. Secondly, From the likeneſs which they have to the Cavity of the Hip-bone, which is call'd κοτύλη, *and contains the head of the Thigh-bone.* From which Reſemblance, they are alſo call'd by the Latins *Acceptabula*, becauſe they receive ſomething into their hollowneſs; but more frequently *Acetabula*, becauſe they are like to little Sawcers, wherein they uſe to bring Vinegar to the Table.

What the Cotyledons *are.*

XXII. *From this Derivation of the Name it manifeſtly appears, That* Hippocrates *and the reſt of the Ancients, by* Cotyledons *never meant any Protuberancies of the Veſſels, or any other fleſhie or mamillary Excreſcencies, or fibrous Ligaments, but ſome certain things that were hollow, or elſe their Cavities themſelves:* And therefore they were all under a groſs miſtake that took thoſe Protuberancies for *Cotyledons.*

In what Creatures to be ſeen.

XXIII. *We are now to enquire in what Creatures they are to be found?* I anſwer; *That they are to be found as well in Women, as in any other Creatures that produce living Births, only different in figure and ſhape.* For in Women, if we do but accurately conſider the Matter, there are not many, but one *Cotyledon*, and ſometimes two in Women that have conceived Twins. For indeed the whole Uterine *Placenta*, which is convex toward the Womb, hollow toward the *Chorion*, is all together, ſomewhat thick, full of Juice, round, unequal in the circumference, exactly reſembling the Herb *Wall-Penniwort*, or elſe the figure of a little Sawcer. Of this Womans *Cotyledon*, *Hippocrates* makes mention *Sect.* 5. *Aph.* 45. *Thoſe Women, who being moderately corpulent, miſcarry at the end of two or three Months, without any manifeſt occaſion, their* Cotyledons *are full of ſlime, and therefore by reaſon of their ponderoſity, are not able to contain the Birth, but are broken.* For if great ſtore of flegmatic ſlimy Humours lye heavy upon the *Placenta*, being ſoften'd and becoming lank in the gibbous part of it, where it ſticks to the inner ſpunginеſs of the womb, of neceſſity it muſt be unlooſned, together with the Birth, which by its means, ſticks alſo to the Womb. Now *Hippocrates* ſpeaks of *Cotyledons* in the Plural Number, not that he would have one Woman, that has conceiv'd but one Birth, have more *Cotyledons* or *Placentæ*; but becauſe he is diſcourſing in the Plural Number of Women in general, who tho' ſingly, they have but one, yet many together have ſeveral *Cotyledons*. This, if many famous Anatomiſts had more attentively conſider'd, and among the reſt our moſt quick-ſighted *Harvey*, they had not ſo unwarily deny'd *Cotyledons* in Women, nor rejected ſo eaſily the Authority of *Hippocrates* in that particular: And therefore, according to the firſt Reſemblance, *Cotyledons* are in Women.

Cotyledons *in Brutes.*

XXIV. *But according to the latter Reſemblance, they are to be found in moſt Beaſts that bring forth living Productions, who during their Impregnation, have ſeveral little pieces of fleſh, ſomewhat thick and hard, ſpungy and prominent, riſing from the Womb in time of Impregnation toward the inner Cavity, and ſticking cloſe to it, and like a Honycomb, hollow'd into ſeveral little conſpicuous Cells, containing a certain Alimentary Juice, as is to be ſeen in Ews, Cows, and ſeveral other Creatures.* And ſome there were that took theſe little fleſhineſſes of the womb, others thoſe little diminutive holes before mention'd for real *Cotyledons*: when as neither the one nor the other have any reſemblance with the Cavity of the *Hip-bone*. But thoſe ſingle fleſhineſſes of the Womb are encompaſs'd by another thin ruddy ſoft piece of fleſh adhering to the *Chorion*, and furniſh'd with the innumerable ſmall Extremities of the Umbilical Veſſels, entring the little diminutive holes of the protuberant *Caruncles* of the Womb, and hollow toward the little fleſhineſs of the womb: Which thin hollow fleſhineſſes adhering to the *Chorion*, and embracing the thick protuberant fleſhineſſes of the womb, are the true *Cotyledons*, having a hollowneſs like the Cavity of the *Hip-bone*: and as the one comprehends the head of the *Thigh-bone*, ſo theſe in like manner comprehend the protuberant fleſhineſſes of the womb: and hence they are called *Loculamenta*, or *Pigeon-holes*, that is, diſtinct Places, each one of which receives a *Caruncle* of the womb. But theſe fleſhineſſes of the *Chorion* in thoſe Beaſts that have 'em, ſupply the place of the *Placenta*, and receive the Juices received by the *Caruncles* of the womb, and conveigh them through the Umbilical Veſſels to the Birth. For that every one of the thin

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Extremities of the *Umbilical Veſſels* adhering to them, are inſerted into the ſeveral diminutive holes of the *Caruncles* of the womb, fill'd with a certain nutritive ſlimy Juice, as a Honycomb is fill'd with Honey, wherewith ſeveral Beaſts ſeem to be nouriſh'd in the womb. Which little Veſſels, when they are drawn forth out of the diminutive holes of the *Caruncles* of the womb, the ſaid ſlimy Juice is to be ſeen ſticking to their Roots, and is extended out of the holes, like ſmall white Threads. Nevertheleſs 'tis very probable, that that ſame Juice being condens'd by the Cold in dead Animals becomes ſo thick, as the Lymphatic Juice is congeal'd into a Gelly, but that in living and warm Creatures it is not ſo thick or viſcous, but thin and fluid, to the end it may the more eaſily glide through the moſt narrow Veſſels into the Cavity of the *Amnion*, and ſo reach to the Birth. But we muſt obſerve by the way, that thoſe little fleſhineſſes of the *Chorion* at the beginning of the Impregnation, are difficultly to be ſeparated from the *Caruncles* of the womb: but the *Embryo* increaſing, as it were come to maturity, are diſſolv'd and looſen'd by degrees, and at length fall off of themſelves, and in the delivery are expell'd, together with the Birth; and the Protuberancies ſwelling from the womb, decreaſe again by degrees, and contract themſelves.

The uſe of the Placenta *in Women.*

XXV. ***The uſe of the Uterine Liver in a Woman is, partly to ſupport the milkie Umbilical Veſſels, which attract the milkie watery Juice out of the Pores or diminutive holes of the womb: partly after a peculiar manner to concoct and prepare the Blood, flowing as well from the Mother, through the Uterine Arteries; partly from the Birth, through the Umbilicals, to render it more ſerviceable for the nouriſhment of the Birth.*** This was *Harvey*'s meaning, where he ſays, *Moreover the* Placenta *concocts the nutritive Juice coming from the Mother for the nouriſhment of the Birth.* But what alteration or concoction the Blood undergoes in Human concoction, that has hitherto not been ſo clearly underſtood, neither has any one written concerning it. For our part, we think it very probable, that the Uterine Liver diſſolves the thicker and ſalt Particles of the Blood, and intermixes it with the ſulphury, and ſo makes the neceſſary bloody ferment for the Blood of the *Embryo*, without which the Blood in the heart of it cannot be well dilated, and performs that function alone, which in Men born the Liver and Spleen perform together. For as in Man born, the Arterial Blood is forc'd through the Splenetic Artery into the Spleen, and therein concocted, after a particular manner, is conveigh'd through the Splenetic Branch and the *Vena Porta* to the Liver, to the end it may be mixed with the venal Blood coming from the *Meſaraic* Veins, there to be concocted again after a new Manner, and to acquire the perfection of a *Fermentaceous Liquor*, and that obtain'd immediately imbibes the venal Blood flowing from all parts, as alſo the *Chylus* gliding through the *Subclavial Vein*, with it's fermentaceous quality, ſo that coming to the Heart, it may be there dilated and turn'd into Spirituous Blood; In like manner, in the Birth, the Blood is forc'd out of the *Iliac Arteries* through the *Umbilical Veins* into the Placenta, to the end it may be mingled with the Blood flowing from the Womb, be digeſted and acquire ſome ſlight kind of *Fermentaceous* power: and ſo it is carryed through the *Umbilical Vein*, to the Liver of the *Embryo*, and flowing through that into the *Vena Cava*, is there mix'd with the Blood and the *Chylus*, (generated out of the Liquor of the *Amnion* ſuck't in at the Mouth of the Birth) flowing from the *Vena Cava*: and ſo all that mixture being prepar'd and imbib'd with a ſlight *Fermentaceous Quality*, paſſes *gradatim* to the Heart, and is therein dilated and made *Spirituous*. Probable therefore it is, that as in the *Embryo*, the *Lungs* are quiet, ſo that the *Liver* and *Spleen* do not as yet officiate, as in a Man born, which is manifeſt, 1. From the bulk of the *Liver*, too bigg for the Body of the *Embryo*; 2. From the Colour of the *Embryo*, too bright, and perfectly ruddy, which in Men born, when it officiates, is black and blue.

The Placenta *ſupplies the Office of ſome other Bowels.*

XXVI. ***Thoſe Bowels therefore, not being able as yet ſufficiently to diſſolve, and prepare them to a fermentaceous height, in the Birth, by reaſon of their weak and tender Conſtitution, provident Nature therefore has ſubſtituted in their place for the time a Uterine Liver, which ſupplies the Office of both from the time that the Blood begins to flow from the Birth, through the Umbilical Arteries into the Uterine Liver, till the Delivery.*** For as in the Birth it is requiſite the Blood ſhould be leſs

less sharp, and consequently ought to be concocted not in both, but in one Ventricle of the Heart; so likewise the *Fermentaceous Liquor* that is to be mixed with it, ought to be less acrimonious, and by the same consequence ought not to be prepared and concocted in the *Liver and Spleen* as in Man born, but only in the Uterine *Placenta*, to the end it may be more mild and temperate when it enters the Birth.

Why the Placenta sticks to the Womb.

XXVII. *Now there are four Reasons to be given, wherefore the* Placenta *sticks to the Womb.* 1. *That thereby the Birth may be more firmly contained in the womb.* 2. *That the watry milkie juices descending from the Womb of the Mother, may be conveniently conveyed through the proper Milkie Umbilical Vessels, passing through the* Uterine Liver *into the Umbilical Diminutive Gutt, and thence into the concavity of the* Amnion. 3. *That the* Placenta *it self may not be nourished only by the Blood of the Birth, flowing through the Umbilical Arteries, which is very small at the Beginning, but also and that chiefly with the Mothers Blood, and so may grow the faster, and be made fit for the performance of its duty; there being a necessity for some dissolution at the beginning, of the Salt or Tartarous Particles in the Blood, by means of a certain slight formentaceous Liquor, to promote more swiftly the Increase of the solid parts.* Vid. l. 2. c. 12. 4. *To the end there may be a more copious Contribution of the Mothers Blood, flowing out of the little Vessels of the Womb, into the Uterin Liver, that that same larger quantity of Blood may be mixed in the* Placenta *with the lesser Quantity of Arterious Blood, flowing thither from the* Iliac Arteries *of the Birth, through the* Umbilical Arteries: *and being there concocted may be endued with a slight fermentaceous Quality, and so falling into the Heart, may be presently dilated and altered into spirituous Blood.* For as in Man born, to the end the Blood may be made right and good, twenty or more parts of the venal Blood are mix'd in the *Vena Cava*, with one part of the *Chylus* flowing through the *Thoracic Ductus Chyliferus*, before they come together to the Heart: So ought it to be done in the Birth: Which not having so much Blood of it self to mix with a convenient portion of the *Chylus*, necessarily for the supply of that defect, there is required a portion of the Mothers Blood, which together with the Arterious Blood of the *Embryo*, flowing thither from the *Iliac Arteries*, being conveniently prepared, is communicated continually to the Birth, through the *Umbilical Vein.*

An Objection.

XXVIII. *Here it may be objected, that that same Blood will flow either into the Umbilical Vessels, or into the substance of the Uterine Liver.* That the first is not true, is apparent from hence, that there is no Communion by *Anastomoses* between the Vessels of the Womb, and the *Umbilicals.* If the latter should be true, then the Extravasated Blood would grow corrupt, which would occasion *Inflammations*, *Apostemes* and other Mischiefs; therefore, *&c.* Now the former being granted I answer to the latter, That the Concoctions of the other Bowels, and many other parts, instructs us, that it cannot be true by any means: For the *Chylus* being pour'd forth into the Glandules of the Breasts is not there corrupted, but concocted into Milk: the venal Blood pour'd forth into the substance of the Liver, acquires a *Fermentaceous Quality* without any corruption, and is carryed to the *Vena Cava*; the Blood also pour'd forth into the Kidneys, despoyl'd of a good part of its *Serum*, without any corruption, is convey'd to the *Vena Cava*: So also the Blood which flows into the Uterine Liver, is not therein corrupted, but is concocted after a peculiar manner, and undergoes some necessary Alteration, which having suffered, it enters the Roots of the *Umbilical Vein.*

The Blood flows from the Womb into the Uterine Liver.

XXIX. *Beyond all Controversy therefore it is, that the Blood flows from the Womb into the Uterine Liver.* Which we find by the flux of Blood that happens for many days in time of Travail by the tearing away of the *Uterine Liver* from those open'd extremities of the Vessels of the Womb, which before gaped into it.

A Watery Milky juice flows from the Womb to the Amnion.

XXX. *But besides the Blood, there is a watery, Viscous, Milkie Liquor which flows from the Womb to the hollowness of the* Amnion, *which is seen to flow forth at the time of Delivery and presently afterwards.* So *Andrew Laurentius* relates, *Anat. l.* 1. *quest.* 10. that he had seen several Women in Tra-

Travail emit a great quantity of *milk* from the womb. *Schenkius* also reports out of *Bauhinus*, that *Capellus*, the Physician, saw a Woman who discharg'd *half a Cup full of milk out of her womb and bladder*. And hence *Deusingius* concludes, that the milkie Juice flows from the womb into the *Uterine Liver*, that is into the *milkie Umbilical Vessels* passing through that Liver. Which Opinion is confirm'd by this, for that often in Women in travail about the end of the Flux, the *Secundines* grow whitish, and become as it were of a milkie colour; which presently ceases through the sucking of the Breasts. But whether that milkie Juice flows from the womb into the substance it self of the *Placenta*, is much question'd by some. Others say, that partly through the ruddy and bloody colour of the *Parenchyma* of the *Placenta*; partly, for that never in the whole *Placenta* that milky Humour, or any thing like it, was to be found by any Anatomists, the contrary is to be asserted. In this Obscurity the more accurate Dissection of Brutes gives us some light, by which we find a certain whitish viscous Humour settled in their *Uterine Caruncles*, into which the Roots of the milky *Umbilical Vessels*, adhering to the little Vessels of the *Chorion*, are inserted, and receive that Juice, and convey it to the Birth. So it seems also probable, that some such like *milky Juice*, in Women, flows through some peculiar *milky Vessels* to the womb into some proper *Caruncles* riveted into the inner porous substance of the womb it self: and that the milky Umbilical Vessels passing through the *Placenta*, are inserted into 'em, which receive that Liquor, and carry it to the *Amnion*. For as in Brutes certain spungy Excrescencies grow out from the womb receiving that Juice, so likewise it is probable that in a Womans womb, there are certain little spungy Caverns for the same use, tho' not conspicuous as in Brutes. For if there be a milky Liquor to be found in the *Uterine Caruncles* of Brutes, which in dead Creatures becomes thick and viscous through the Cold, and thence sufficiently to be seen, without doubt also, within the porous substance of a Womans womb, there must be some little Caverns by which that milky Juice flowing from the womb is particularly collected and receiv'd. And as from the Veins of the womb, and the Arteries gaping toward the *Placenta*, the blood is pour'd into the bloody parts of the *Uterine Liver*, and carried from them through the *Umbilical Vein* to the Liver of the Birth, so it is likely that the milky Juice is carried from the little milk-bearing Cells of the womb into the *Umbilical milky Vessels*. But because those Uterine Cells of the milky Juice have not hitherto been observ'd by any Person, this is no proof that they are not there; for the *Lymphatic Vessels* themselves, the *milky Mesenteries* and *Pectoral Vessels* lay conceal'd for many Ages; and yet it cannot be said but that they were there. So likewise at this day the Production of the *Urinary Passage* in the Birth without the Navel, and the *milky Vessels* running toward the Breasts, are not conspicuous, tho' it be most certain that the Urine of the Birth flows through that passage into the *Allantoides*, seated between the *Chorion* and the *Amnion*; through this, the *milky Chylus* is carried to the breasts. Moreover, Anatomists have seldom an opportunity in a breeding Woman to observe the substance or constitution of the womb, or of narrowly surveying the *Uterine Placenta* when whole; or if any such opportunity were offer'd, no body has hitherto thought of looking after those milky Uterine Cells: And besides the Passage of the *milky Vessels* through the *Placenta*, being broken by reason of the softness of the substance, and the flowing forth of the blood, cannot be seen. To which we may add, that in Women, for some time dead, those *milky Cells* of the Womb, and *milk-bearing Vessels* of the Womb are impossible to be discern'd, as they might be discover'd in the bodies of such as come to a suddain end, and presently open'd. We must conclude therefore, that as in Brutes the Maternal *milky Juice* is collected in the little Cells of the Caruncles of the Womb; so also in Women that Juice is receiv'd by certain little Caverns of the womb, fix'd into its inner substance, which is porous in certain places while the Woman is breeding, tho' they do not swell out in that manner, nor are so manifest as in Brutes. For if there were no such things as those little *milky Cells*, to what use should those *milky Vessels* be, as well those of the Mother extended to the womb, as the *Umbilical Vessels* of the birth? Which nevertheless that they are both there, I do not think is at all to be question'd: For that there are *Uterine milky Vessels*, has been found by the more quick-sighted Anatomist sometimes since; as we shall shew more at large in the next Chapter. So likewise that there are *Umbilical milk-bearing Vessels*, is apparent from hence, that there is a milky Juice

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contain'd in the little Gut, flowing from thence to the hollowneſs of the *Amnion*, which when the whitiſh Colour ſufficiently declares that it is not carried through the *Vaſa Sanguifera*, of neceſſity it muſt come thither through the milky Veſſels extended from the Navel of the birth toward the womb. But becauſe this Juice is not ſo white as the milk of the breaſts, but of a more watery Colour, *Wharton* therefore will have it to be call'd rather *Gelly*, and that, becauſe it is ſomewhat clammy and clear, and being cold congeals like Gelly, and that not only in the *Amnion*, but in the little Gut; for it is found in both.

But *Gualter Needham* will oppoſe both what has been ſaid, and what is to be ſaid in the next Chapter, who labours altogether to perſwade us, that this ſame milkie or chylous Juice is carried not through any milkie Veſſels, but through the Arteries, together with the blood toward the Womb; and there again being ſeparated pure from the blood, is emptied into the hollowneſs of the *Amnion*. As if there were any underſtanding or provident ſeparating faculty in the Arteries, by whoſe inſtinct they knew how to carry that milky Juice forc'd into 'em by the heart, together with the blood, afterwards, in the time of Child-bearing, and at no other time, pure and unmix'd, without any other blood, directly to the womb, and perhaps to the breaſts, but no where elſe: and there to ſeparate it with ſo much prudence from the blood, and ſend it from the ends of the Arteries toward the hollowneſs of the *Amnion*, to the end this thicker and more ſlimy Juice ſhould flow from thoſe ends, but the arterious blood which is much thinner and fluid, out of a particular favour, ſhould be detain'd in its own Veſſels. Moſt ſtupendious Miracle of Nature! But perhaps it may be objected, Choler in the Liver, Serum, Matter, Tartar in the Kidneys, in ſpontaneous and procured Looſneſſes, as vicious Humours are ſeparated from the blood, and ejected forth, what wonder then that the ſame ſhould happen to the *Chylus*, as to the womb? I anſwer, that thoſe ſeparations of the ſaid Humours from the blood in the Liver, Kidneys, and other parts, are made by the force of the Bowels fram'd to that end; of which, the whole conſtitution of the Subſtance and the Pores is ſuch; as likewiſe the peculiar fermentation proceeding from thence, that thoſe Bowels being ſound and well, of neceſſity muſt make thoſe ſeparations, and cannot act otherwiſe: in like manner as the peculiar *fermentaceous Juice* generated in the *Duodenum* by the power of the *Liver* and *Sweetbread*, ſeparates the whitiſh *Chylus* from the *Alimentary Maſs* concocted in the *Stomach*. But if the *Chylus* were to be ſeparated from the arterious blood near the womb, it muſt be done without the help of any Bowel, or without any peculiar *fermentaceous Juice* generated in any Bowel particular ordained for that uſe; for no ſuch Bowel is there at any time to be found. Add to this, that not any ſuch ſeparation whatever could bring it to paſs, that that ſame milky Juice ſhould be determin'd to certain particular parts, as the womb and breaſts, and that at particular times, of breeding and giving ſuck, and at no other time. For the heart is the one and only general thruſter forth of the arterious blood, and that continually, without any diſtinction of parts or times, but to all parts and at all times. Laſtly, this is alſo to be conſider'd, that thoſe ſaid *Chylous* and *milky Humours* before that ſeparation from the blood; really and actually ought to have been in the arterious blood, and to have been mix'd with it: whereas on the contrary, never any true *Chylus* either actually or potentially is contain'd in the blood that paſſes through the heart, nor there dilated, and ſo thruſt forward into the Arteries, as we ſhall ſhew *L.* 2. *c.* 12.

CHAP. XXXI.

Of the Membranes enfolding the Birth; and the humours therein contained.

I. *NExt the Uterine Liver follow two Membranes enfolding the Birth, and as it were encloſing it in an* Egg, Chorion, *and* Amnios, *which becauſe being both joyn'd together, they are expell'd out of the womb together with the* Placenta, *preſently after the birth of the Child; are by the Latins call'd* Secundæ *or* Secundine, *Seconds or Secundines; by the Greeks* ὕστερα *and* ἐπίγονα, *as being things that come forth in the ſecond place.* *Secundines.*

II. *The* Chorion *is an Exterior Membrane encompaſſing the whole* *The Chorion.*

Birth, thick and interwoven with several small diminutive Fibres, like Threads, smooth within, and somewhat rough without; here and there sprinkl'd with a little Fat, and where it sticks to the bottom of the Womb by the help of the Placenta, *furnished with several Vessels proceeding from the first Caruncle described* C. 29. *As also from the Uterine Liver, and Umbilical Vessels:* Of which those are to be seen in great number in the *Chorion* before the Formation of the Birth; but these, after the Navel is grown out to its full length from the Birth, enter the Membrane, and are intermixed with the former, and so being strengthened with this Membrane as with a Coverlet, pass forward to the *Uterine Liver* annexed to the *Chorion*.

The Urinary Membrane.

III. Nicholaus Hoboken, *besides the* Chorion, *describes another Membrane, thin and transparent, not having any visible Branches of Vessels, very like the* Amnios *sticking to the* Chorion, *and easily separated from it with the Nails, without the help of a Penknife; but sticking very close about the Region of the* Placenta *sticking to the* Chorion. This third Membrane between the *Chorion* and the *Amnios*, *Needham* was the first that found out, and call'd it very fitly the *Urinary Membrane*, rationally affirming it to supply the place of the *Alantoides* in Brutes, and that between that and the *Chorion*, the Urine of the Birth was collected and kept till Delivery. And thus by this Invention of the most famous *Needham*, and the Confirmation of the same by *Hoboken*'s Inspections into the *Secundines*, all those Doubts are most splendidly removed concerning the *Alantois* of Women, and the Place where the Urine of the *Embryo* is contain'd, and preserv'd till delivery. I my self, by *Needham*'s Directions, have sought for and found it; and so laid aside all those Doubts which have puzl'd me before concerning the *Alantois* in Women. This Membrane, when others also saw, they took it for the inner part of the *Chorion*, and so asserted the *Chorion* to consist of a double Membrane, to which Opinion many other Anatomists gave their Consent.

Amnios.

IV. *The* Amnios *is the inner Membrane, next enfolding the Birth and softly enclosing it, hence call'd by the Names of* Amiculum *and* Indusium, *the* Cloak, *or* Shirt, *gently resting upon the Chorion, yet no where joyn'd to it, but only in one very small place in the upper Part at the Caruncle describ'd* C. 29.

This is very thin and single, soft, smooth, and transparent, distant from the Birth with a loose Space, furnished with little Vessels hardly Visible, issuing from the foresaid Caruncle, and the umbilical Vessels. This Membrane *Aquapendens* thought to be double; who perhaps lighting upon the *urinary Membrane* before mentioned, thought it to be a part of the *Amnion*. Now these small Vessels by reason of their extraordinary Exility, are very rarely to be discern'd by the Eye, and therefore *Hoboken*, and some others thought it had no Vessels; but erroneously, when Life, Nourishment, and Growth, teach us that it cannot want Vessels; seeing that in the Spiders web-like, and glassy Tunicle of the Eye, there are no Vessels conspicuous; and yet they are no less nourished with Blood than other Parts, and those Vessels are sufficiently conspicuous in the Net-like Tunicle wrap'd about the vitreous Humour. *Needham* writes that these little Vessels are manifestly to be discerned in a new ejected and warm *Amnion*, but vanish as soon as it comes to be cold. *Wharton* moreover allows the *Amnios* Lymphatic Vessels, which in regard they are at no time to be seen, nor any way useful therein, whether they be there or no, I very much doubt.

The Caul on the Head.

V. *Sometimes at the time of Delivery it happens that a torn-off Part of this* Amnios *will stick to the head of this Birth, and that the Child is born with it, as if he had a Caul or Cap upon his Head, for which reason such Births are called* Galeati, *or with Caps or Cauls on them.* From this Cap the Midwifes make great Observations upon the future Good or Ill Fortune of the Infant, according to the Diversity of the Colour, and diligently preserve it, as a Fee belonging to themselves, by that means to scare and terrify the Parents of the Infant with their Fictions and Stories, and procure the more Money for it from the Parents, whom they ridiculously make believe that if the Infant did not eat that Cap in Powder, or else carry it about him all his Life time in a Box, he should prove unfortunate or else Epileptic; or be

be continually haunted with Spirits and Hobgoblins: but if he did eat or carry it about him, that then he ſhould be happy and fortunate.

The Condition of the Membranes in Twins.

VI. *But we are to obſerve, that when a Woman has conceived Twins, they are for the moſt part wrapt about with one* Chorion; *but that each* Embryo *has a diſtinct* Amnion, *and that there is contained in each* Amnion, *a diſtinct milkie Humour, as we find in Cheſſnuts and Almonds, the outward Shells of which, tho' they include two Kernels, yet each Kernel has its proper Tunicle whereby they are ſeparated one from another.* Now if it happen that the *Amnions* of Twins are broken by any blow, fall, bruiſe, or through any other means; or elſe were not ſufficiently diſtinguiſhed at the beginning, then the *Embryo*'s in thoſe Parts where they touch one another grow together, and a Monſter comes to be brought forth. But many times it alſo happens, that the diſtinct *Embryo*'s are enfolded in diſtinct *Chorions*.

The reaſon thereof, and of monſtrous Births.

VII. *The reaſon of this was formerly altogether unknown; but ſince the diſcovery of Womens Ovaries and Eggs, it is eaſily explain'd. For as we often ſee in Hen Eggs two Yolks, with their diſtinct Whites, ſeparated by a very thin Membrane, included in one hard Shell, and from ſuch Eggs impregnated by the Cock and ſet under the Hen, rarely two and well form'd Chickens hatch'd, but frequently one monſtrous Chicken, with four Wings and Feet, and two Heads; for that the Membranes being broken, the two Chickens being hatch'd together grow into one.* So it may happen in the Eggs of women, that two Eggs may be included in one harder Shell, which conſtitutes the *Chorion*: And then if the Membranes of the *Amnios* are ſtrong enough, the Twins remain ſeparated one from the other, and Navels iſſuing from each, are inſerted both together into one *Placenta* adhering to the *Chorion*, and at length brought to Maturity, come forth apart in the Delivery, and when the latter is come forth, there follows but one *Secundine*, which contained 'em both in the womb: Neither can there be two *Placentæ*, becauſe but one *Placenta* can be faſten'd to one *Chorion*. But if the Membranes of the *Amnios* were very weak and broken, then the Twins immediately reſting one upon another, grew together by reaſon of the extream Softneſs of the bodies; and ſo being joyn'd together come forth monſtrous in the birth. But if it happen that two diſtinct mature Eggs impregnated with the male Seed, ſlip out of the womans Ovaries through the *Fallopian Tubes* into the Womb, then each *Embryo* comes to be included in diſtinct *Membranes*, *Chorion*, and *Amnion*; and each alſo, (of neceſſity to receive the Navel of each *Embryo*) have a diſtinct *Placenta* adhering to its proper *Amnion* (as in Brutes that bring forth ſeveral at a time, every *Embryo* has a diſtinct and peculiar *Placentula*) and come forth apart at the time of Delivery, their proper Secundines following each; unleſs by chance the *Placentæ* ſtick more cloſely to the Womb; and then at length being both together looſen'd, both the *Secundines* follow after the Delivery of the Twins: And ſometimes we have ſeen one Twin follow the other not till the next, or two days afterward. As in Twins, ſo it is when a woman has Conceived three or four Children at a time, which Births are here very rare, but frequent in *Scotland*. From what has been ſaid alſo ariſes the Solution of that Doubt concerning the number of *Placentæ* in Twins, when one, and when two or more are neceſſary: That is, *one*, when Twins are comprehended in *one Chorion*; *two*, when each are included in their *proper Chorions*: Which two nevertheleſs lye ſo cloſe many times to one another, that they ſeem to be but one at firſt ſight. For the umbilical Veſſels of each Twin, paſſing thorough their proper *Chorion* and *Amnion*, ought to be preſently inſerted into the *Placenta* growing in the exterior part of that *Chorion*; to the end that by its means the *Embryo* may ſtick to the Womb. But they muſt not be inſerted into the *Placenta* growing to the *Chorion* of another Birth, as being that which thoſe Veſſels do not immediately enter, nor ſo much as tend toward it.

The Original of theſe Membranes.

VIII. *Theſe two Membranes, the* Chorion *and the* Amnios, *are vulgarly thought to be Productions of the Membranes of the* Abdomen *of the Birth. For that the* umbilical Veſſels *proceeding from the* Abdomen *of the Birth, are included within two Membranes, conſtituting the lit-*

tle Gut: Of which the innermost, which is the thinner, is thought to be produced from the Peritoneum; *the outermost, which is the thicker, from the* Carnous Membrane These Membranes being dilated to the end of the Navel, and expanded about the Birth, out of the innermost the *Amnion* is said to be form'd, out of the Exterior the *Chorion*: And this is the Opinion of *Harvey*. *Hippocrates* also seems to intimate the same thing, where he says, *out of the Navel extended are form'd two Membranes*. Who also saw in the Conception of a singing Wench, a Membrane produced from the Navel which contained the Conception. If any one object, that these Membranes are generated before the parts of the Birth are delineated. I answer, that the Threads of the first Delineation, tho' they are not visible to the Eye, are yet in Being. For in a Hen-Egg we observe a little ruddy dancing Poynt (which is thought to be the Heart) which cannot beat unless it receive something thorough the Veins, and force it through the Arteries; and yet tho' neither the one or the other are visible, yet Reason teaches us, that they are in Being. In like manner in a human Birth, tho' all the first Lineaments are not to be seen, yet they are there, and the Navel may be produced out of them, together with the Membranes infolding the Birth. If any one shall say that in a Hen-Egg there are Membranes before the Navel is delineated, nay before the Egg is set under the Hen: I answer, that in an Egg, before the Delineation of the Parts, all things requisite ought to be in readiness; which cannot be contributed by the Hen toward their Delineation; as in Creatures that bring forth live Conceptions they are prepared by degrees together with the Delineation. For these receive from the Womb of the Dam more Nourishment over and above to supply their Growth; from which Nourishment also these Membranes delineated out of the Female Seed receive their Growth.

These Opinions of *Harvey* pleased me also formerly, but after I saw, in the Abortions described *c.* 29. these Membranes already form'd, nay very large and strong, before the Formation of the Birth begun, while the procreative Matter is collected in the Crystaline Bubble; no Threads at all being as yet extended from the Bubble; and also in the beginning of the *Embryo* already form'd, a Foundation hardly conspicuous to bud forth out of the belly, nor any the least Delineaments of the Vessels extended from it through the Colliquation or dissolv'd Matter, toward the Membranes; but the *Embryo* altogether free, nor joyn'd to any part swimming upon the Colliquation; and both Membranes already sufficiently strong, and wrap'd about the whole dissolv'd Matter, and furnished with conspicuous Vessels, I thought my self obliged to recede from that Opinion, and not without reason; in regard it was impossible that such strong Membranes, so conspicuous and so large, should be generated out of any invisible String (of which *Harvey* speaks) which never any Person could so much as dream to be form'd out of the Bubble at first collected together.

IX. *Therefore these Membranes do not arise from their Beginning; but are generated in the Womens Ovaries themselves out of the female Seed, as we have said* c. 24. *and are encompassed with Eggs. Which Eggs being afterwards discharged into the Womb, their outward Membranes swell, and the* Chorion *grows thicker (like Leather steep'd in Water) and being very much dilated, constitute these two Membranes, the* Chorion *and the* Amnion. And as the outward Shell of a Hen or other Birds Egg, before it be laid, sticks with a little Branch to the Ovary; so also in a woman these Membranes by means of a Caruncle sticking to the *Chorion*, adhere not to the Ovary but to the Womb it self at the very beginning; as appears in the Abortions describ'd *c.* 29. and perhaps in that very part where the Egg descends out of the Tube into the Womb; and embrace the whole dissolv'd Matter together with the Crystalline Bubble collected therein; and so within their Walls, through the benigne Cherishing of the *Uterine Heat, the Architectonic Spirit latent in the Bubble, is set at Liberty, and roused into Action.* As for those slender small *Vasa Sanguifera*, which from the beginning are seen dispersed through the *Chorion* (as we have observed in the forecited Abortions) I have observed them to be produced not from the Birth then not as yet form'd, or from the Crystalline Bubble, furnished as yet with no blood or blood-bearing Vessels; but from that fleshy, spungy, and plainly rubicund Particle, which at the upper part stuck to the *Chorion*, and

Their true Original.

and seem'd to be endamag'd without-side, and as it were torn from the Womb (so that it might appear that the *Chorion* stuck to the Womb by means of it) which seem'd to receive those little Vessels from the Vessels of the Womb by Continuation, and so send them to the *Chorion*.

Alantoides. X. *Besides the foresaid Membranes, there is in Brutes that bring forth living Conceptions, a third Membrane found in form of a Bagg, very thin, and furnish'd with no visible Vessels.* This by *Galen* and the ancient Physicians is called ἀλαντοειδὴς, from ἀλλὰς, a kind of Pudding, like the Gut wherein Puddings use to be made. For according to *Suidas*, ἀλλὰς is taken for ἔντερον a Gut. Hence the Latins call it the *Farciminal*, or *Pudding Membrane*, and sometimes the *Intestinal* or Gut Membrane; tho' it does not in all Creatures retain the shape of a Pudding or Gut, but in many resembles a broad Swath.

What it is. XI. *It is a most thin Membrane, smooth, hollow, soft, and yet thick, without any Vessels conspicuous to the Eye, by no means enfolding the whole Birth, extended to the utmost extremity from one Horn of the Womb to the other, waxing slender at the extream Parts that enter the Horns of the Womb, till it end in a Point.*

Its Original. XII. *It rises with a narrow Beginning, where the* Urachus *or Passage of the Urine, continuous to it, opens into its Hollowness, and presently dilates it self.*

Situation. XIII. *It is seated between the* Chorion *and the* Amnion, *from which it may be easily separated.*

Its Use. XIV. *Its Use is to collect the Urine of the* Embryo, *flowing out of the Bladder through the* Urachus, *and to preserve it till the time of Delivery.* From which use of it, *Needham* calls it in all Creatures which have a *Placenta*, the *Urinary Membrane*.

Its Shape and Bigness. XV. *Its Bigness and Figure varies according to the Difference of Creatures.* For in some it resembles a Gut in shape and bigness, in others a broad Swath, and is much larger, as in a Cow, much more in a Mare, in which Creature it is every way fastened to the *Chorion*, and enfolds the whole Birth together with the *Amnion*. But as for its bigness and shape in Sows, Coneys, Doggs, and some other Creatures, *Gualter Needham* exactly describes upon View. *l. de format. Fœt.* And in the same place adds the whole discourse concerning it, and the manner of finding it out in Brutes.

Whether any Allantois *in Women?* XVI. *Now seeing that Urine abounds in the Conceptions of all Creatures that bring forth living Births, while they remain in the Womb, and that there is a necessity for the same to be discharged out of the Womb, and reserv'd somewhere till the time of Delivery, the Question is whether this Membrane* Alantois, *be in all Creatures, especially in Women? Aquapendens* says, that Women, Cats, and Bitches are destitute of this Membrane, as also are all other Creatures that have Teeth in both Jaws: And that the Urine of their Conceptions is collected in no peculiar Vessel, but flows out of the *Urachus* between the *Chorion* and the *Amnion*, and is there reserv'd till the time of Delivery. But our modern more quicksighted Anatomists have found it now in many of those Creatures who were deny'd it before. Yet do these very much question whether it be in Women. *Harvey* who overlook'd it in Brutes, denies any such thing in Women. On the other side, *Highmore* not only allows it to Brutes, but admits it in Women; and assigns it in them the same Use, which it is vulgarly said to have in Brutes: That is, to receive the Urine of the *Embryo* through the *Urachus*, and reserve it till the time of Delivery: And agreeing with *Vesalius*, says it is easy to be found, if in a bigg-bellied Woman the Dissection should be begun from the *Placenta*, otherwise by reason of its extream Slenderness it is easy to be broken. But here *Needham* well observes, that *Vesalius* at the time that he wrote, had never dissected any woman with Child (as he confesses himself in the same place) and therefore made a Judgment of women by what he observ'd in doggs: And describ'd a human *Embryo* wrap'd in the *Secundines* of a Whelp. But afterwards, when he had dissected a woman with Child, he changed his Opinion, and number'd but two Membranes in a woman, that is to say the *Amnion* and *Alantois*, reaching the *Chorion* not under the name of a Membrane, but of the whole Conception. In this Obscurity, the Quicksighted *Needham* gave us great Light, who describes not any *Farciminal* or Pudding-like Membrane, such as the *Alantois* in many beasts, but a bagg quite of another Fashion, wherein the Urine of the Conception

ception is collected and reserved till the time of Delivery. *The Secundines*, says he, *being received by the Midwife, let 'em be laid in their proper Posture, as well as may be. Then taking a small Packthread, follow it as far as the* Amnion. *This is fastened to the Packthread a little below the* Placenta, *the rest hangs free. If the* Amnion *be fresh, you shall find the little Veins of it; otherwise they vanisht, the Blood being run out, and the Membrane cold. This being left about the Packthread, go to the next Membrane, which if you prick without side about the* Placenta, *or tear the extream Edges with your Fingers, you shall find to be easily divided into two; of which the outermost is porous and spungy, and full of little Veins; the innermost very slippery, and extreamly transparent, but void of Veins and* Arteries. *That I take for the* Chorion, *this for the* Urinary Tunicle. *It cannot be call'd a folding or facing of the former, because of the dissimilitude of the Substance; but whether we look upon the Situation, Figure, or Substance of it, it is the same with the* Urinary Membrane *of all* Placenta *breeding Animals. But it is not shap'd like the* Alantois, *neither is there any Membrane of that Figure in a Woman.* From which words it is apparent that there is no such *Alantois* allow'd to women as in beasts. But this also appears over and above, that *Needham* rightly and truly asserted the inner thin Membrane next adhering to the *Chorion*, to supply the place of the *Alantois* in women, and that the Urine flow'd out of the bladder of the birth through the *Urachus*, between that and the *Chorion*, where it is reserved till the time of Delivery. And this Invention of *Gualter Needham's*, *Nicolas Hoboken* found out, confirm'd, and describ'd, in most *Secundines*, *lib. de Secund. Human.*

A milkie Liquor within the Amnion.

XVII. *Within the* Amnion, *besides the* Embryo, *is contained certain milkie Liquor in great Quantity, very like to watery Milk, somewhat oylie, which* Harvey *calls the* Colliquamentum, *or dissolv'd Matter, in which the* Embryo *swims, and which sticks to it, when first born, all over the Body, and is usually washed off by the Midwife with warm Water, or Wine and Butter.*

The Filth sticking to the Birth.

XVIII. *But here I think it necessary to distinguish between that Liquor wherein the* Embryo *at its first Delineation swims, and that wherein it swims afterward.* For the first is the seminal Residue of the Mans and Womans Seed, and is well and truly call'd the dissolv'd Matter. But the latter is that, which when the former is consum'd, and the Navel being now brought to the *Uterine Liver*, flows through the Umbilical Vessels, and is a Juice meerly milkie, but watery, not to be call'd by the Name of *Colliquamentum.*

Here by the way, we may take notice of the Error of *Fabricius*, and some others, who thought that same unctuous Uncleanness sticking to the body of the Child new born, to be an Excrement of the third Concoction, made in the whole habit. As also of that Mistake of *Claudius de la Courvee*, who *lib. de nutrit. fœt*, writes that it is nothing else than an Excrement, falling from the Brain through the Mouth and Nostrils. But it was nothing but the Ignorance of the Nature and Use of the *milkie Liquor* contained in the *Amnion* that produced these Errors.

What the Liquor in the Amnion *is.*

XIX. *Concerning the Liquor in the* Amnion, *there are two different Opinions of the Physicians: While some think it to be the Urine, others the Sweat of the Conception. But neither of the two have hit the Mark.*

Whether it be Urine.

XX. *That it is not Urine, appears by this, for that this Liquor is found in the Birth new form'd, in great abundance, whereas so small an* Embryo *never discharges any Urine.* Nay, for that it is found in the *Amnios* before the birth is form'd; whereas there can nothing of Urine flow from the Crystalline Bubble.

Whether Sweat.

XXI. *That it is not sweat, is hence apparent, that before the Birth is form'd and perfected, or else from the beginning of the Formation of the Birth, it is impossible that Sweat so unctuous, and thick, and in so great abundance should flow from so small an* Embryo, *which exceeds in quantity, ten times or more, the little Body of the* Embryo.

Moreover, if this Liquor were an Excrement, whether Urine or Sweat, or any thing else, it would encrease as the Birth grows. But ocular Inspection teaches us the contrary. For in Sheep it so manifestly abates by degrees, as the Birth enlarges, that a little before the Lamb is yean'd, there is hardly any remaining; tho' it abounded at the beginning.

ginning. Laſtly, Sweat and Urine are acrimonious Excrements, wherein if the tender *Embryo*, covered with an extraordinary thin and ſoft Skin, ſhould ſwim for nine or ten Months together, it would be much injured by that Acrimony. As we find the Skin of new born Infants to be many times very much corroded by the Sharpneſs of the Urine: tho' their Skin be much harder and firmer than the Skin of the Birth in the Womb.

Whether any Steam.

XXII. Riolanus, Anthropog. l. 6. c. 7. *acknowledges this Liquor to be the Sweat of the Birth; but* c. 8. *he ſays it is the Steam of the arterious Blood fuming from the Heart, and ſo turn'd into that Water that ſurrounds the Birth.* Which if it were true, that Liquor ought to be at the beginning, whereas there is none or very little blood as yet, neither can be any or very little, but is more and more increaſed as the birth enlarges: Whereas on the contrary it abounds very much at the beginning, and from that time forward abates by degrees: And how little is to be found in Sheep after yeaning, has been ſaid already.

It is an Alimentary Humour.

XXIII. *Therefore this Liquor contain'd in the* Amnios, *is no Excrement, but an Alimentary Humour, and nouriſhes with its Matter, out of which at the Beginning is taken the Nouriſhment of all and ſingular the Parts of the* Embryo: *And hence follows their Encreaſe. For it is the next Nouriſhment wherewith the Birth is nouriſhed at firſt.* For therein it is found to ſwim, before the *Uterine Liver* manifeſtly appears, from which at length being enlarged, the Umbilical blood-bearing Veſſels manifeſtly ſuck forth blood; with which alone, if the birth were to be nouriſhed, it would for ſome time at the beginning want all manner of Nouriſhment, neither would there be any Alimentary Matter to ſupply the firſt Growth of the Parts. But hence alſo it appears to be a nutritious Humour, and to be taken in at the Mouth by the Birth, for that in Colour, Taſt, and Conſiſtency it differs little or nothing from that Liquor which is found in the Stomach of the Birth.

What ſort of Liquor it is.

XXIV. *In the firſt forming of the Birth this Liquor is nothing elſe but the Seed of the Woman (like the white of an Egg) incloſed in the Egg, mix'd with the Reſidue of the Mans Seed being diſſolv'd.* Afterwards when the umbilical Veſſels are grown to their juſt length, and entered the Uterine Liver, then is the milkie Juice carried thither through the milkie Umbilical Veſſels from the milk-bearing Cells of the Womb, whoſe whitiſh Colour, ſweetiſh Taſt, and likeneſs of Subſtance little differ from the Chylous Liquor, ſomewhat mix'd with the *Lympha*, and which is found in the *Pectoral Chylifer Channel*, and its Receptacle. Whence it is altogether probable, that it is the purer part of the *Chylus*, ſomewhat watery by its Mixture with the *Lympha*, carried from the Mother to the Hollowneſs of the *Amnios*, through the Paſſages mentioned in the foregoing Chapter; nay it is pleaſing to the Taſt, like watery Milk; for which we do not take ſo much the Judgment of our own Taſt, but *Harvey*'s Proof from this, that almoſt all brute Creatures that bring forth living Conceptions, lick it up from their young ones newly brought forth, and ſwallow it; whereas they never touch the Excrements of the Birth.

Whether it proceed from the Nerves.

Wharton writes, that it is a Liquor poured forth from the Nerves within the *Amnion*; perchance, becauſe that being deceived by the white Colour, he took the milky Veſſels to be Nerves.

Needham thinks that it is a milky Liquor carried thither through the Arteries, ſomewhat mixed with the Nervous Liquor: which Opinion we refute, *l.* 2. *c.* 12.

Hoboken's Opinion.

XXV. Nicolas Hoboken *alſo aſſerts this Liquor to be carried thorough the Arteries, tho' after another manner.* For tho' up and down in other places of his book *de ſecund. Human.* he writes that he could not obſerve any blood-bearing Veſſels in the *Amnios*: Yet in his Treatiſe *de ſecund. Vitul.* he writes that the Arteries poſſeſs in a plentiful number the Tunicle of the *Amnios*, and that in that place there is a great Correſpondence between them and very many ſmall Glandules, not only in great number beſieging the outer parts of the little String, but the inner parts of the *Amnios*: So far forth as by means of thoſe little Glandules, the Arterious blood carried thither, is affected and prepared, that the ſaid Liquor may be thence conveighed to the Hollow of the *Amnios*. But he does not add what Alteration it undergoes, nor does he any way prove that Correſpondence

which

which he ſuppoſes by Conjecture. Moreover in many parts, by means of the *Glandules* the *Lympha* is ſeparated from the blood, as Choler in the Liver, the ſplenetic Juice in the Spleen, *&c.* But it was never heard that any Juice which is not in that blood, could be ſeparated from it, or that the Arterious Blood could be changed into milkie Juice.

A Difficulty concerning the milkie Uterine Veſſels and the Umbilicals.

XXVI. *Here we meet with one Difficulty, that is to ſay, that the milkie Veſſels, as well thoſe that come from the Mother to the Womb, as thoſe that run from the Birth to the Womb, are never to be ſeen,* But no Man will make a wonder of this, who ſees how eaſily all blood-bearing Veſſels, even the Chyle-bearing Pectoral Channel, which is ſomewhat bigger, ly hid when empty; and ſometimes the Lymphatic Veſſels being empty'd diſappear, ſo that they neither be diſcern'd or found any more. He alſo that has obſerv'd how inviſible thoſe Paſſages are through which ſometimes in the *Dropſy* the ſerous Humours of the *Abdomen*, and in the flowing of the *Whites*, that vaſt Sink of the Vitious Humours is emptyed through the Womb, from the Liver, Meſentery, and other Veſſels of the *Abdomen*. So alſo theſe milkie Uterine and Umbilical Channels, without Queſtion, are very ſmall, and in dead women evacuated, and thence they have hitherto ſo long layn hid, that they have ſcap'd the Sight of the Anatomiſts. Of which nevertheleſs there have not long ſince been ſome Diſcoveries made, which ſome Perſons not dreaming of the milkie Veſſels, have taken for *Lymphatics*, others for diminutive Nerves.

Vanhorn *obſerv'd* 2 *milkie Branches deſcend towards the great Artery*, &c.

XXVII. Charleton *reports that* Vanhorn, *a famous Anatomiſt of* Leyden, *in an Epiſtle to* Thomas Bartholin, *wrote that he obſerv'd two milkie Branches deſcending toward the Separation of the great Artery, extended to the Seat of the Womb near the Crurals.* Something alſo to this purpoſe has *Anthony Everard* obſerved in Coneys: For he writes that in a Coney with young, he obſerv'd ſome milk-bearing Channels, ariſing from the deſcending Trunk that run along together with the Spermatic Veſſels to the parts ſerving for Generation. *Deuſingius* gives a clear ocular Deſcription of theſe Veſſels; *de hum. Corp. Fab. p.* 7. *c.* 3. *For*, ſays he, *that there are milkie Veſſels alſo belong to the Womb, conveighing Alimentary Juice to the Birth, we have not only in another place, by moſt ſolid Arguments demonſtrated; but obſerv'd by ocular Inſpection in Bitches Whelps innumerable diminutive milkie Branches running through the broad Ligaments of the Womb, to the Horns themſelves, and the whole Body of the Womb. Moreover we obſerv'd in the Year* 1655. *a little milkie Branch entring together with the Umbilical Veſſels through the Navel of the Whelps contained in the Womb.* And as in other Creatures ſo there is no Queſtion to be made but there is in Women. But tho' we have not hitherto ſeen theſe milkie Conveighances to the womb, however it ſuffices for the Demonſtration of the Truth, that they have been diſcovered by more quick-ſighted Anatomiſts; and that alſo it may be demonſtrated by moſt certain Arguments, that of neceſſity they muſt be there, tho' they are ſeldom conſpicuous. 1. Becauſe there is a great Similitude in Colour, Taſt, and Subſtance between the Liquors of the Chyle-bearing Pectoral Channel and the *Amnios*. 2. Becauſe in breeding Women, a certain Chylous Milkie Liquor flows in great abundance from the womb. As has been obſerv'd and ſeen by *Andrew Laurentius*, *Zacutus*, *Luſitanus* and others. 3. For that colour'd Liquors being ſwallowed down, come preſently to the womb, which cannot penetrate thither ſo ſuddainly through any other than the milkie Veſſels conceal'd and devious from the reſt. Thus writes *John Heurnius*, that upon the giving of Saffron in Broths, a Woman brought forth a Child ſtain'd with a Saffron Colour. Alſo *Henrie ab Heers* reports, That a Woman having ſwallowed Saffron, within half a quarter of an Hour brought forth a Child ſtained with a yellow Colour. Which Colour could not poſſibly reach ſo ſoon to the womb and the birth, unleſs together with the *Chylus*, it were carried thither, through certain milkie Veſſels devious from the reſt. For if the Saffron were firſt to be concocted in the Heart, and then to be carried thither with the Blood, it would loſe its Colour. Or grant it ſtill to be retained, yet it would require the Interval of ſome Hours before it could come to the womb. Concerning this Matter ſee ſome other things ſaid *c.* 18. whereby the remarkable Experiment try'd by *Herdotius* in a Bitch with Puppy, this ſame devious Paſſage of the milky Juice to the womb is made very apparent,

apparent, and there illustrated with other Observations.

Curveus *his mistake.*

XXVIII. *Here we are to take notice of the mistake of* Curveus, *who writes, that at the beginning there is a Humour in great abundance collected between the* Chorion *and the* Amnios, *and that that being filter'd through the Membrane of the* Amnion, *penetrates to the inner hollowness of the* Amnion; *and that this inner Juice differs not from the other, but only in its thinness caus'd by the same filtration.* Whereas the Humour, which is found without the *Amnion*, is not contain'd simply in the *Chorion*, but between the *Chorion* and the *Urinary Membrane*; neither is there any at the beginning in that part to be filter'd, whereas from the very beginning the moisture moderately abounds in the *Amnion*; and whereas the inner Juice is not thinner, but much more thick and viscous than that which afterwards increases between the *Chorion* and the *Urinary Membrane*. Moreover, the milky Juice of this *Amnion*, being boyl'd, grows to the consistence of a Gelly, but the other without the *Amnion* thickens without any boyling. The first is apparent by the Experiment of *Rolfinch*, *Lib.* 6. *Dissert. Anat. c.* 32. Where, says he, *We boyl'd the Humours wherein the Birth swims with a gentle heat, when the thinner Particles being consum'd, that which remain'd at the bottom was clammy like Glue. The Humours upon the Tongue taste somewhat sweetish, so that this glutinous Substance is grateful to the taste; neither is there any thing of luxivious or salt in it.* But it does not only grow thick and viscous by boyling, but also the Cold congeals it to a moderate thickness and viscosity, by which I have seen this Juice thicken'd in the *Umbilical Intestine* to the thickness of a perfect Gelly, and in the *Amnion* to the consistency of the white of an Egg.

The passage of the Juice.

XXIX. *Now tho' it may seem to be a thing unquestionable that this milky Juice is carried through some milky Vessels from the Mother to the Womb, and from that through the milky Vessels of the* Placenta, *within the hollowness of the* Amnion, *yet from what part of the Mother, and from whence these milky Vessels proceed toward the womb, has been hitherto discovered by no body that I know of.* Some by uncertain Conjectures believe that they are extended thither from the *Thoracic* Chyle-bearing Chanel, others from the Chyle-bearing Bag, others from the Sweet-bread. Of which, if any clear demonstration could be made out, the Question would be at an end. *Ent* most couragiously endeavours to dispel this Cloud of Darkness, *Apol. Digress.* 5. where he writes, That this Liquor is deriv'd from no inner milky Vessels, but that it flows from the Womans breasts to the womb, and that the birth is nourish'd with the Mothers milk, no less within than without the womb: and for this reason he believes the Teats of brute Beasts to stand so near the womb; to the end the milk may flow from them more easily to the womb. But as for the passage which way, he takes no great care: For he writes that the Milk descends from the breasts through the *Mamillary* Veins, and from thence into the *Epigastrics*, joyned to them by *Anastomoses*, and through those flows down to the womb. But that he may not seem to contradict Circulation altogether, he says, *That it may happen without any prejudice, that there may be a Flux contrary to the usual Circulation through some Veins, if there be a new Attractor.* He adds, *That it is for this reason that the Milk is generated in the breast so long before delivery; that is so soon as the Woman quickens. So that if the Milk did not flow to the birth, the Woman would be very much prejudic'd, and the Blood being detain'd for three or four Months together would be corrupted.* Lastly, he annexes the Authority of *Hippocrates*, who says, *Aph.* 5. 37. *If the breasts of a Woman with child suddainly fall and grow lank, she miscarries. For*, says *Ent*, *when the Milk fails in the breast, there can be no nourishment afforded to the birth in the womb, which for that reason dies, and is thrown out by Abortion.*

Ent's *Opinion confuted.*

XXX. *But tho' these things are speciously propounded by* Ent, *yet there are many things that subvert the learned Gentleman's Argument.*

1. Because that milky Liquor abounds within the *Amnion*, before any thing of Milk be generated in the breasts.

2. Because it is impossible that the blood should be carried upward, and the milky Juice downward at the same time through the *Mammillary* and *Epigastric* Veins.

3. Because that between the *Mammillary* and *Epigastric* Veins there are no such *Anastomoses* as he proposes.

4. For that the milky Liquor of the Breasts passing through those blood-conveighing

veighing passages, would lose its white colour by its mixture with the blood, and so it would not be found to be white, but red in the *Amnion*.

5. For that the feeble heart of a small *Embryo* could never be able to draw this milky Juice from the Mothers breasts: besides that, there is no such distant attraction in the body of Man, and whether there be any such at a nearer distance, is much to be question'd.

6. For that the Milk, from the one half of the Womans time, till the time of Delivery, never remains in the breast, but entring the *Mammillary* Veins, together with their blood, is carried in the order of Circulation to the *Vena Cava*, as the *Chylus* reaches thither through the *Subclavial* Vein, which is the reason it is neither corrupted, nor does the Woman any prejudice at all.

7. As to *Hippocrates* his affirming the lankness of the breast to be a sign of Abortion; for this in a Woman shews that either the *Chylus* is defective, or that it is all carried to the heart, and none to the womb or breasts. Hence *Hippocrates* concludes, That if formerly the *Chylus* flow'd in great abundance to the breasts, they dry up of a suddain, as appears by the lankness of the breasts, much more will that fail which is carried in a lesser quantity to the womb, for the nourishment of the tender birth, and that through much narrower Vessels, and so of necessity the birth must dye for want of nourishment, and be cast forth by Abortion.

That this milky Juice does not come from the Breasts.

XXXI. ***From all which it is apparent, that milky Juice, let it come from what parts it will to the Womb, it does not come from the Breasts; and that their Opinion is most probable who believe it flows from the Chyle-bag, the Pectoral Passage, and other Internal Chyle-bearing Vessels, tho' there has been as yet no clear Demonstration of those Passages.***

The Opinion of Vesslingius *touching the use of this Juice.*

XXXII. Vesslingius *either not observing, or ignorant of the nourishment of the Birth at the Mouth, ascribes to this milky Liquor of the* Amnion *a use of small Importance.* For he says that it only preserves the tender Vessels of the *Embryo* swimming upon it, in the violent Motions of the Mother; and when the time of Delivery approaches, that it softens and loosens the Maternal places by its Efflux, to render the passage of the Infant more easie: Moreover, he thinks it to be the more watery part of the Womans Seed, as we have said before *Cap.* 28.

The Amnios, Urinary Membrane *and* Chorion *stick close one to another.*

XXXIII. *The* Amnios, Urinary Membrane *and* Chorion, *at the Caruncle in Abortions describ'd* Cap. 29. ***sticks close one to another (where they transmit the Umbilical Vessels toward the Uterine Liver) but every where else they lye loosely only at the beginning of the Conception***; and when at length the Umbilical Vessels have pass'd those Membranes, then through the flowing in of the Urine of the birth through the *Urachus*, the Urinary Membrane begins to recede from the *Chorion* (which till that time seemed to be the inner part of the *Chorion*; and between that, and the *Chorion* the urinary serous Humour begins daily to increase, as the birth grows; so that near the time of Delivery it is there to be found in great quantity.

The Opinion of Riolanus.

XXXIV. ***This Urinary Liquor*** Riolanus ***denies to be there, and affirms that there is no Liquor to be found without side the*** Amnios. ***And so*** Vesslingius ***seems never to have distinctly observ'd it; for he says that no Humour can be collected together between the Membranes of the birth, by reason of their sticking so close together.*** But Ocular inspection teaches us that there is no such close Connexion, but only a loose Conjunction or Imposition one upon another. The whole mistake seems to have proceeded from hence, That it was not known that the Urinary Membrane containing the Urinary Liquor, lay hid between the *Chorion* and the *Amnion*, and drew back, and was extended from the *Chorion* upon the flowing in of the Urine of the birth. Whence many question'd whether any Liquor could be contain'd in that place: which Cloud is now dispell'd by *Needham*'s late Discovery of the Urinary Membrane.

The urinaceous Humour separated from the Liquor of the Amnios *in Brutes, where it is collected in the* Alantois.

XXXV. ***We have many times seen the said Urinaceous Humour contained between the*** Chorion ***and the*** Urinaceous ***Membrane, manifestly separated from the Liquor of the*** Amnios ***in such Brutes where it is collected in the*** Alantois: ***and in Bitches, the demonstration of the separation is easie to be made.*** For if you take a Puppy by the head, as yet wrapt up in its Membranes, you shall see these Humours by the means of the *Membranes* of the *Alantois* and *Amnion* separated one from another,

ther, and the ſerous and turbulent Humour inclos'd in the *Alantois*, and ſo to remain between the *Chorion* and the *Amnion*, but that the other milky Juice is contain'd within the *Amnion*. Then open the *Chorion* with the *Alantois*, preſently the outermoſt milky Juice flows forth, but the other milky Juice remains in the *Amnion*. And thus we muſt conclude that the ſerous Urinary Humour in Human Conceptions is collected and reſerv'd between the *Chorion and the Urinary Membrane*, but that the other milky Juice is enclos'd within the *Amnion*. And that we lately demonſtrated in a Woman that had almoſt gone out her time, ſuddainly choak'd with a *Catarrh*; finding the watery Urinary Liquor to a great quantity inclos'd between the *Chorion* and the thin *Urinary Membrane*, which we then thought to be the *Alantois*; the other milky Juice reſiding within the *Amnion*; tho' there was not ſo great a quantity of it. This was the firſt body where I thought I had ſeen any ſhadow of an *Alantois*, but afterward, by the preceding demonſtration of *Needham*, I perceiv'd there was no *Alantois* in Women, like the *Alantois* in Beaſts; but that the Urinary Membrane ſupply'd its place.

What the Serous Humour is?

XXXVI. ***Now what this ſerous Humour is, contain'd between the*** Chorion ***and the*** Urinary Membrane, ***till our very times, both Phyſicians and Anatomiſts, have been in great doubt: And this in certainty begat 2 Opinions.*** *According to the firſt*, many believ'd that it was not ſome Excrement, but a kind of Humour like Butter-milk, leſs nouriſhing than that contain'd in the *Amnion*; and that the purer part of it ſerv'd for the nouriſhment of the birth, and was carried to it through the little Fibres of the Umbilical Veſſels extended thither according to *Harvey*'s Obſervation: but that the more unprofitable part was reſerv'd for the preſervation of the birth till the Delivery; by its ſoftneſs to defend the birth from External Injuries, and to moiſten and make ſlippery the privy parts in time of Travail. *According to the other Opinion*, others thought that this Humour was the Urine of the Child, diſcharg'd through the *Urachus*, and receiv'd by degrees between the *Chorion* and the *Urinary Membrane*, there to be reſerv'd till the time of Delivery, to moiſten the Female parts, and render them ſlippery, for the more eaſie paſſage of the birth. For the latter of theſe Opinions we give our voice; becauſe it is altogether neceſſary, that all the parts of the birth being form'd, the Kidneys ſhould perform their duty, and ſeparate the ſuperfluous copious, *Serum* from the blood. For the nutriment of the birth, that is the blood and the milky Juice, is very ſerous, that being the more liquid and fluid, they may paſs with more eaſe to the birth, and be the better digeſted by the new-form'd Bowels. But it was requiſite that ſuperfluous *Serum* ſhould be ſeparated from the profitable Juice, to forward the growth of the parts, which would otherwiſe be altogether ſerous, and render the birth diſtended with an *Anaſarca*. Now the Kidneys ſeparate that ſerous Excrement, out of which it ſlides through the *Ureters* into the Bladder, wherein it is to be found in great quantity in *Embryo's* of five or ſix Months growth, wherein all things appear more clearly to the Eye. But it flows not out of the Bladder through its Orifice, becauſe at that time the overſtraitned Sphincter does not tranſmit the Urine: For ſuch was the Supream Creators pleaſure, leſt the Urine flowing out of the Genitals, ſhould be mingled with the milky Juice which the birth takes in at the Mouth, and defile, corrupt, and render it unfit for Nouriſhment. And therefore another paſſage was provided for it thorough the *Urachus*, riſing from the bottom of the Bladder toward the Navel. Which tho' in Men born it be conſolidated in the ſhape of a Ligament, like the Umbilical Vein growing out of the liver of the birth; yet while the birth is included in the womb, it is always penetrable, and ſufficiently conſpicuous as far as the Navel; and conveys and pours forth the Urine out of the Bladder between the *Chorion* and the *Urinary Membrane*, there to be reſerv'd till the time of Delivery.

The miſtake of Deuſingius.

XXXVII. ***They that do not agree with us in this Opinion, are wont to ſay, That this ſerous Humour is found very plentiful between the Membranes at the beginning of the Formation of the Birth.*** Even *Deuſingius* himſelf following the Opinion of *Harvey*, writes, *That then it exceeds in quantity a hundred times any other Humour contain'd in the* Amnion, *and therefore it cannot be Urine; but that of neceſſity it is a Humour very requiſite for the nouriſhment and ſecurity of the birth, tho' not ſo good as that other which is contain'd in the* Amnion. But theſe are meer Figments altogether contrary to Experience. For in the beginning of the Formation of the birth,

this Humour appears not at all, but about the fourth Month a very little is to be ſeen; and from that time forward, as the Birth and the Reins increaſe, and the Kidneys do their Office, ſo much the more it augments. But herein appears their miſtake, that while they labour to defend their Opinion with great heat, they do not diſtinguiſh between the Serous Humour excluded out of the *Amnion*, and the milky Juice abiding within the *Amnion*; and by means of the *Urinous Membrane*, and the Tunicle of the *Amnion* it ſelf, ſeparated from the *Serum* it ſelf. Moreover, they do not take notice that the milky Juice is that which from the beginning of the birth is moſt plentiful, neither unpleaſing to the taſte or ſmell; and is ſo conſum'd for the moſt part in many Brutes, that there is nothing hardly remaining at the time of the birth. Whereas on the other ſide, the other Serous Humour is not to be ſeen at the beginning of the Formation; but afterwards appears in a ſmall quantity, and ſo augments by degrees. Neither has it any thing of a whitiſh colour; but gains both colour, taſte and ſmell, as it increaſes, and at length, at the time of Delivery, comes away in great quantity, and with a ſtrong ſmell. Wherein if the birth had immediately ſwam in the womb, the tender little body had ſuffer'd no ſmall prejudice without ſide, by reaſon of its Acrimony; nor leſs within ſide, for that being continually ſwallow'd in at the Mouth down the Stomach, it muſt needs have extreamly afflicted the *Embryo*.

The miſtake of Riolanus.

XXXVIII. *The leſs attentive conſideration of this Matter deceiv'd* Riolanus *alſo, who did not obſerve that there were two and two plainly diſtinct Humours, of different Natures, contain'd between the Membranes, but took 'em both together for one and the ſame Humour, which he thought reſided within the* Amnion. Which miſtake of his is apparent by what has been ſaid already.

CHAP. XXXII.

Of the Navel-ſtring, its Uſe, and the Nouriſhment of the Birth.

The Name.

I. THE *Membranes infolding the Birth being open'd, the Navel comes to be ſeen, ſo call'd from* Umbo, *ſignifying the Boſs of a Shield, becauſe it is in the middle of the Belly, or the Center of the lower Belly; by the Greeks call'd* ὀμφαλὸς, *and by* Ariſtotle ῥίζα γαστρὸς, *the root of the Belly.* Some, with *Galen*, have aſſerted it to be the Center of the whole Body, which *Veſalius* places better in the joyning together of the Share-bones.

The Navel, what it is?

II. *The Navel-ſtring is a membranous winding and unequal Chanel riſing from the mediety of the* Abdomen *of the Birth toward the Uterine Liver, conſpicuouſly long, and when the Birth is fully mature three ſpans, rarely half an Ell in length; and about a fingers breadth in thickneſs.* Which longitude and laxity was requiſite at firſt, to the end the Birth now become ſtronger in the womb, ſhould not break the Navel with its tumbling and kicking; but come more eaſily into the World without breaking it, and the remaining Secundines ſticking to it, be more eaſily drawn forth.

Its Situation.

III. *It turns back for the moſt part above the Breaſt, and produces it ſelf toward the left from the hinder part of the Head to the Forehead, and hence proceeding to the Uterine Liver, is joyn'd to it by the Veſſels contain'd in it, and the Membranes.* Sometimes it proceeds forward toward the right ſide, hence it winds about the Neck, and ſo deſcends to the *Placenta*. Sometimes I have obſerv'd it turn'd back above the Breaſt, toward the hinder Parts and Back, never coming at all to the Neck; for Nature wonderfully varies in its ſituation. Even very lately I found it above the Breaſt and Head, and evolv'd about the left Foot. Rarely as *Skenkius* obſerv'd in a difficult Labour of his own Wife, that the Navel ſhould wind about the Neck of the Birth, with two or three Circumvolutions. More rare what *Hoboken* obſerves of a Birth, whoſe

whose Navel was wound four times about the Neck, the Head being next the *Placenta*; which Birth having broken the *Membranes*, came forth with the *Secundine* altogether.

Its Vessels. IV. *The Navel-string consists of Vessels, and a little Pipe containing Vessels, call'd the* Diminutive Gut.

The Umbilical Vessels, which proceed from the Birth, are usually reckon'd to be four; one Vein, two Arteries, and the *Urachus*. But to these the milky Vessels are necessarily to be added, through which the milky Liquor is conveyed from the little Caverns of the womb into the hollow of the *Amnion*.

The Umbilical Vein. V. *A Vein larger than the Arteries rises from the Liver of the Birth, out of the Cleft of which it goes forth to the foundation of the* Vena Cava, *of which it is a Sprig; and thence passing the Navel, it runs through the Navel-string to the* Placenta, *into which it is ingrafted with many roots.* *Harvey* deduces its first Original from the Heart, but erroneously; for it comes not to the Heart, but by the means of the *Vena Cava*. And so its Original is rather to be deriv'd from the *Vena Cava*, and the Original of the *Vena Cava* from the Heart.

The use. VI. *It has been hitherto the vulgar Opinion, that the Blood flowing from the* Placenta, *is pour'd forth into the Liver of the Birth, and there farther concocted to the highest perfection of Blood.* On the other side, *Harvey* writes, *That there is no use of the Liver in the* Embryo, *and that therefore this Vein passes entirely through the Liver directly to the* Vena Cava; *and so that the Umbilical Blood suffers no alteration neither in the Liver, but flows directly through that into the* Vena Cava, *and thence to the Heart, there to be dilated into a more spirituous Blood.* *Riolanus* asserts quite another thing, *That the Umbilical Vein is twofold in the Liver, and equally communicates as well to the* Porta, *as the* Cava, *and that he learn'd it by manifold Experience.* *Dominic de Marchettis* testifies also, *That he once saw the same thing:* And *Frederic Ruysch*, *That he discover'd and shew'd it in the Liver of a Calf newly calv'd.* And so they believe that some part of the Umbilical Blood is emptied into the Liver, and the other half pour'd forth into the *Vena Cava*. At first sight Reason seems to perswade us to give great credit to *Harvey*. For that the Ferment, which in Men born, by reason of the harder Nourishments that are to be dissolv'd, ought to be more sowr and sharp, is made in the Liver and Spleen: But in the Birth, where in respect of the softer Nourishment it ought to be more mild, it is made in the *Uterine Placenta*, so that there is little or no use of the Liver and Spleen; nor of the Lungs; but that those Vessels chiefly grow, and are reserv'd for future uses: and hence it may seem probable that the Blood passes directly through the Liver to the *Vena Cava*, without any remarkable alteration, and thence directly to the Heart. This *Glisson* seems more strongly to confirm, who describes a certain veiny Chanel in the Liver, which easily admits an indifferent Probe; open in Children new born, and *Embryo's*; in Men grown always shut; which tends directly to the *Vena Cava*, and is given to that end that it should bring the Stream of Blood flowing through the Umbilical Vein into the *Vena Cava*. Which last cannot be true, seeing that all the Spermatic parts, of which one of the principal is the Liver, are delineated together, and that this Liver is first conspicuous among the rest of the Bowels, afterwards the Heart, long before the Umbilical Vein, and in a short time grows to a remarkable and conspicuous bigness. But tho' the aforesaid Reasons seem very plausible for *Harvey* and *Glisson*'s Opinion; yet that *Riolanus* and *Ruysch* were much more in the right, I could easily prove by my own Observation. For that I might understand this matter more certainly, I resolved to try an Experiment upon a Still-born Infant: To that purpose having open'd the *Abdomen* with the Breast, I blew through a Straw thrust into the Umbilical Vein, and observ'd that presently I blew the Heart and the Lungs, yet so that the Liver also receiv'd somewhat of the breath; without doubt through the lateral little Branch taken notice of by *Riolanus* and *Ruysch*, and inserted into the Liver or *Vena Porta*; which tho' in the first Months it be so slender, that it is hardly discernable, nevertheless 'tis most likely that afterwards this little Vessel increases with the rest of the Parts, and contributes more Blood to the Liver, towards its swifter growth, the better to prepare and fit it for its future Office; which for some time it begins in the womb before Delivery, as is apparent from the Gall, which is found in the Gall-bladder of a Child born perfect, but in an Abortion

of

of six or seven Months, and in the Excrements of Children newly born. For the Liver does not presently after the Delilivery, as it were, skip to its office of bilious Fermentation, but is us'd to it by degrees in the womb.

Its Valves. VII. *The Umbilical Vein therefore conveys the Blood prepar'd in the* Placenta *to the Birth; the return of which into the* Placenta *is prevented by several* Valves *looking toward the Birth, and sustaining the violence of the Blood, endeavouring to flow back.* Nevertheless these *Valves*, by reason of their extraordinary slenderness, can hardly be demonstrated; but that they are there, we have just reason to conclude, because the Blood cannot be squeez'd with the finger from the Birth toward the *Placenta*, but may easily be squeez'd toward the Birth. *Nicholas Hoboken* writes, *That he could find no genuine* Valves *in the Umbilical Vein, but that he observ'd several winding inequalities; and near the* Placenta *saw a Caruncle, or rather a little membranous separating fold, so situated according to the length and depth of the Vein, as to terminate the veiny spreading forth of the Branches, and seem'd to supply the place of a little* Valve; which he calls *Analogous to the Valve.*

The Error of Courveus. VIII. *Here we are to take notice of the mistake of* John Claudius de la Curvee, *who believ'd there was nothing conveyed to the Birth through the Umbilical Vein from the* Uterine Placenta, *but that quite the contrary, the Blood flow'd from the Birth to the* Placenta; *because this Vein grows from the Birth first, and proceeds to the* Placenta, *therefore, says he, the Blood must first flow into the* Placenta, *and so be carried toward its own End inserted into the* Placenta. But not only the foresaid *Valves* plainly demonstrate *Curveus*'s Error, but also the trial made by a Ligature, of which in due place. Besides, his Reason drawn from the Original of the Umbilical Vein, is of no moment; for the beginning of the Production does not argue the beginning of the Use; but its aptitude for any farther use. Thus the *Vena Cava*, according to *Harvey*, is produced from the Heart, nevertheless the Blood does not flow from the Heart into the hollow *Vena Cava*, but out of the *Vena Cava* into the Heart: Thus the Roots of Plants grow downward into the Earth; nevertheless the Nourishment is conveyed from them out of the Earth to the Plants, and not out of the Plants into the Earth.

The Umbilical Vein in Brutes. IX. *The Umbilical Vein does not seem to be order'd after the same manner in Brutes as in Men.* For *Fabricius* observes in a Bitch and a Cat, beside the Vein already mention'd, two other Umbilical Veins that pass away to the Mesenteric Veins, and open themselves into them. One near the Stomach, the other near the thick Guts. But *Highmore* writes that he has found in Cows an Umbilical Vein always double. Perhaps also there may be some difference in other Creatures, which we leave for others to enquire.

The Umbilical Arteries. X. *The* Umbilical Arteries, *being two, derive their Original from the Internal Iliac Branches of the great Artery, at the beginning of the spreading of the Branches; from which being stretched forth upward toward the sides of the Bladder, and having got the Vein in their Company, they enter the Navel-string, and pass through it with a much more winding and looser Chanel than the Vein, and so these three Vessels, sometimes in order lightly twisted, sometimes opposed one to another only like a Triangle, pass thorough the milky Gelly contained in the Navel-string, pass to the Uterine Liver, into which they are ingraffed with innumerable Roots, and form therein a most wonderful Texture, and Net-like Fold, which* Bartholine *seeing, says that those Vessels close one among another in the* Placenta, *with a wonderful* Anastomosis; *which nevertheless is not very probable, neither can any body demonstrate the truth of it.* Neither *Carpus* nor *Fabricius* make any mention of any *Anastomosis*; but only they observe about a Spans distance from the Birth, a more confus'd contexture of these three Vessels, and a ruder Contorsion. I my self formerly more accurately intent in the examination of the Navel, found and shew'd sometimes a certain slight, sometimes no Contorsion at all, but that these Vessels, as it were, placed in a Triangle, and almost at an equal distance, disjoyn'd one from another, passed directly through the Gelly of the Pipe of the Navel-string, as has been said.

XI.

Theſe Arteries hard to be found in the Embryo for the firſt Months: yet form'd and grow together.

XI. Harvey *writes, that theſe Arteries are hardly to be found in the* Embryo *for the firſt Months, but that the Umbilical Vein is conſpicuous long before theſe; and hence he believes that theſe Arteries are form'd later, and ſometimes after the Vein.* But it is more probable that theſe three Veſſels are form'd and grow together, ſeeing that the *Parenchyma* of the *Uterine Placenta* cannot be ſufficiently enlivened without theſe Arteries, and rows'd into action; and alſo that there could be no uſe of the Umbilical Vein, unleſs the Vital Blood were carried firſt through the Arteries to the *Placenta*. But the reaſon why they are later conſpicuous, is this, becauſe they are much leſs and ſlenderer; for which reaſon, in moſt other parts, the ſmall Arteries are not ſo diſcernable as the Veins: but that the largeneſs of the ſaid Arteries is not always alike, but narrower near the little Nodes of the Pipe of the Navel-ſtring, ſo that they ſeem to knit themſelves into little knots, is the Obſervation of *Hoboken*.

The Uſe.

XII. *Through theſe Arteries Blood and Vital Spirit is conveyed, not from the Mother to the Birth, (as many with* Galen *believ'd,) but from the Birth, by the preſſing forward of the Heart to the Uterine Liver, for the further Colliquation, after a more ſpecific manner, of the Blood flowing from the Uterine Veſſels, and to the end it may be concocted with it, that ſo Matter may be prepared and better fitted for the Nouriſhment of the Birth, which being carried through the Umbilical Vein to the Bowels of the Birth, may be more conveniently dilated in the heart of the* Embryo, *and acquire new perfection of Blood.*

The motion of the Blood through the Navel.

XIII. *Ocular Inſpection clearly demonſtrates this motion of the Blood. For if the Navel of a living* Embryo *(as may be experimented in Beaſts) be ty'd in the middle, the Pipe of the Navel-ſtring being opened, preſently the Arteries between the* Embryo *and the Liver, are ſeen to ſwell, and to be depriv'd of all motion; whereas on the other ſide the Vein ſwells between the Ligature and the* Placenta, *and flags toward the Birth: which ſhews that the Arterious Blood is forc'd from the Birth to the* Placenta, *and the Venal Blood from the* Placenta *to the Birth.* Or the ſame thing may be try'd after another manner without a Ligature, if you ſqueez the Blood with your fingers through the Vein from the *Placenta* toward the Birth, for ſo it eaſily moves; but it cannot be forc'd the contrary way by reaſon of the reſiſtance of the *Valves*: but the Blood is with great difficulty forc'd through the Arteries to the Birth, whereas it flows readily, and of its own accord, to the *Placenta*.

No Anaſtomoſes.

XIV. *Many there are that write ſeveral things of the* Anaſtomoſes *of the Arteries with the Veins, and of the Veins with the Arteries, quite repugnant to Ocular Inſpection, ſeeing that no ſuch* Anaſtomoſes *can be found in the* Placenta. Which *Hoboken* has accurately taken notice of, who by the injection of Liquor has perfectly examin'd this matter.

No Union of the Umbilical Veins with the Arteries.

XV. *Now what is to be thought of the union of the Umbilical Veins and Arteries with the Womb, let us briefly enquire.* *Galen* and *Ariſtotle* teach us, That the Orifices of the Umbilical Veſſels are united with the Ends or Orifices of the Veſſels of the Wombs. So that the Roots of the Umbilical Vein draw Blood from the Veins of the Womb, and the Arteries Spirit from the Arteries. To which Opinion *Aquapendens*, *Sennertus*, and ſeveral other famous Men, have ſubmitted their conſent: Others, confirm'd by Ocular Inſpection, deny this union of the Veſſels, with whom we alſo agree. For there are ſeveral Arguments to ſhew that there are no Union or *Anaſtomoſes* of the Umbilical Veſſels and the Womb.

1. Becauſe ſuch a Union of the Veſſels would bind the Birth ſo ſtrongly to the Womb, as not to be diſſolv'd in time of Travail. Or if by the violent ſtrainings of the Woman in Labour, it ſhould be violently torn away, there would happen ſo many and ſuch pernicious Wounds by the rending of the ſeveral united Veſſels, that the Effuſion of Blood would ſoon be the death of the Woman in Travail.

2. Becauſe the Blood may deſcend by degrees into the *Placenta* through the gaping Veſſels of the Womb, to be prepared therein for the growth and nouriſhment of the Child. But never any Anatomiſt hitherto could obſerve any farther productions of the Veſſels of the Womb;

Womb, either toward or into the *Placenta*, so that whatever has been written concerning this matter, has been written by Conjecture.

3. Because that such a Union of the Vessels of the Womb and the Umbilicals being granted, there could be no use of the *Uterine Placenta*: for the Blood flowing through that continuity, nothing of it could either come into the Substance of the *Placenta* it self, or be elaborated therein.

4. Because the Umbilical Veins do not proceed to the Womb, but spread their Roots only through the Uterine Liver, and from thence, and not from the Womb, immediately assume the Alimentary Blood which is to be carried to the Womb; as Plants by means of their Roots suck up their Alimentary Juice out of the Earth.

5. Because the Arteries draw nothing from the Womb or its Arteries, but convey Vital Blood from the Birth to the *Placenta*, and end there in little Branches.

6. Because in the beating of the Umbilical Arteries, the measure is altogether different from the Pulse of the Mother.

7. Because it has sometimes happened, that the Mother being dead, the Birth has sometimes supervived in the Womb; which could never be, if the Birth should receive its Vital Blood from the Arteries of the Mother. For the Mothers Pulse failing, the Birth must dye either sooner, or at the same time.

The Umbilical Vessels do not rise from the Uterines.

XVI. *Hence the mistake of* Vesalius *and* Columbus *is apparent, who following* Galen, *thought that the Umbilical Vessels were not only joyn'd together with the Uterine Vessels, but also by continuation were deriv'd from them, and extended from the Womb to the Birth.* Which Error is easily evinc'd by this, not to repeat what has been already said, That in the Abortive *Embryo* seen and describ'd by us, the beginning of the Navel-string did not arise from the Womb, but from the Birth. Besides that, in Chickens the beginning of the Umbilical Vessels, manifestly arises from the Chicken it self, which being separated into several Branches, are extended from the Chicken to the Yolk of the Egg. In like manner as in Vegetables the Roots are not extended out of the Earth into the Plants, but out of the Plants into the nourishing Earth: which is more apparent in Onions, which being hung up without the Earth, send forth Roots from themselves.

Whether form'd before the Heart.

XVII. *From the foresaid Opinion proceeded another as absurd, That the Umbilical Veins and Arteries were generated and form'd before the rest of the Bowels,* as Bauhinus *endeavours to perswade by divers Reasons, as if the Bowels could not be form'd without blood conveyed from the Womb.* Whereas among the more acute Philosophers it is undoubtedly concluded that they are form'd of the Prolific part of the Seed, and that after their Formation already finish'd, the Nourishment of the said Vessels proceeds to the farther part from those Bowels, and hence they first grow to a greater length, and are extended to the *Placenta*.

How these Vessels pass through the Membranes.

XVIII. *But here some one will make a Query, How those Vessels, when they have grown out to that length, from the Belly of the Birth, as to reach the Membranes, can penetrate through the* Chorion *and* Amnion *to the* Uterine Liver. I answer; 'Tis done after the same manner as the Roots of Plants and Trees penetrate into the hard Earth, and sometimes enter Walls and Stones, which Water cannot penetrate. For so the sharp and slender ends of the Umbilical Vessels, insinuate themselves by degrees into the Pores of the Membranes, and pass through 'em, tho' the Humours contain'd within the Membranes cannot pass thorough. But afterwards, when those Vessels adhering to the Pores grow out more in length, the said Pores are also more and more dilated, to which the Vessels are already united and indissolubly joyn'd.

Dorsal Roots.

XIX. Riolanus *makes mention, out of* Avicen *and* Varolius, *before the Generation of the Veins and Umbilical Arteries, of two Capillary Vessels, which he calls the* Dorsal Roots of the Birth; *which are from each horn of the Womb, inserted into the upper and hinder part of the coagulated Seed, through which necessary Blood is supplied to the Formation of the Parts, in the mean while that the Umbilical Vessels are strengthened; and which afterwards vanish when the Foundations of the Parts are laid.* But that these are mere Figments is apparent from hence; because the Birth is neither form'd nor generated out of the coagulated, but melted and dissolved Seed, and out of the

the subtile part of that, which is call'd the Flower. Besides, these *Dorsal Roots* would be to no purpose, when the Parts ought to be delineated out of the Prolific Flower only of the Male Seed, which is apparent from the Egg, wherein tho' there be no Blood contain'd, nor can be supply'd from any other place, yet the Parts are form'd, and being form'd generate Blood out of the obvious Alimentary Matter, wherewith all the delineated Parts are nourish'd, increase and come to perfection. We should now speak of the milky Umbilical Vessels, but that we have so largely discoursed of 'em already, *Cap.* 30. However, this I add, or rather repeat, that *Gualter Needham* seems to acknowledge no milky Vessels in this place, for he assigns another way to this milky Liquor: For that being concocted in the Stomach of the Mother, and mix'd with the Blood, and circulated with it through the Sanguiferous Vessels, it is in that manner carried to the Womb, and there mix'd with the Blood of the Birth, and then that part of the Maternal Blood, that wants not any farther Concoction and Fermentation, is converted into the Blood of the Birth, but that the rest of the nutricious milky Juice, that wants a farther Concoction, is separated from it, and laid up in the *Amnion*, as matter of future Nourishment, to be carried through the Mouth into the Ventricle of the Stomach, and there to be digested. Which Opinion we have refuted more at large *Cap.* 30.

The Urachus, *or Urinary Vessel.*

XX. *The fourth Umbilical Vessel manifestly conspicuous, is the* Urachus *or* Urinary Vessel, *a thin, membranous round little Body, having a little hollow passage quite through it, rising from the bottom of the Bladder to the Navel, in the midst between the Vein and the Arteries.*

It is pervious in large brute Animals.

XXI. *This in most Brute Animals of the larger size, being manifestly pervious, and by the Observation of* Hoboken, *furnished with no Valves, is carried to the* Urinary Membrane *above describ'd (for in lesser Animals the Passage of it is hardly discernable) between which and the* Chorion, *the Urine of the Birth is emptied into it, there to be reserv'd till the Time of Delivery.* *Hieronymus Fabricius* writes, that this Vessel in most brute Animals, where it rises out of the bladder, is but only one Passage or Chanel; but where it farther extends it self without the *Abdomen* toward the *Alantois*, it is divided into many small Fibres, which is the Reason that the Urine flows into the Pipe of the Navel-string, but does not easily flow back into the *Urachus*, tho' you endeavour to force it back. So likewise *Needham* observes, That in the Bladder of larger Beasts there is a Liquor found like to that which is contain'd in the *Alantois*, and that if a Pipe be adapted to the Bladder, the Wind will be blown into the *Alantois*.

How it is observed in Mankind.

XXII. *But in Man the Extension of the* Urachus *is observ'd no farther than the Navel only, beyond which no farther progress of it was ever demonstrated by any Anatomists.* And hence it has been concluded by most, That the *Urachus* is only extended to the Navel, and serves for the Ligament of the bottom of the Bladder, and that it is not pervious quite thorough. Which *Arantius* asserts in downright terms: *In my Opinion*, says he, *that which seems in the Human Bladder to bear the form of a Chanel or* Urachus, *is no other than a Ligament of the Bladder, which being somewhat broader at the bottom, lessens by degrees, like an Awl: So that when it comes to the Navel, it vanishes quite away, having no Cavity all the while; but only as I conjecture, appointed to bind the Bladder to the* Peritonæum, *and to sustain it, lest when distended with Urine, it should compress the neck of it at the subjected Parts.* So *Pareus* writes that he could find no passage of the *Urachus* in Man by all the Art he could use. Thus also *Needham* reports that he could not find the least footstep of an *Urachus* in the Navel-string of a Man; much less any Cavity of it. But Reason teaches us that the Use of this Ligament is the less necessary, seeing that the Bladder is so closely joyn'd to the Region of the *Share*, that it needs no other Ligament, and therefore that this part is design'd for some more noble Use, of which *Avicen*, and *Fabricius ab Aquapendente* better perceiv'd, who say that the *Urachus* does not terminate in the Navel, but pass through it, and go out of it; and proceeds farther together with the Umbilical Vein and Artery, and that is to the Membranes enfolding the Birth, and that in Brutes it opens into the *Alantois*, and conveys the Urine out of the bladder of the Birth, and by consequence in Man it o-

pens between the *Chorion* and the *Urinary Membrane.*

Why it is not conspicuous without the Abdomen.

XXIII. *But the Reason why it is not conspicuous without the* Abdomen *is this, for that perhaps either no Body was sufficiently diligent in the farther search of its Progress: Or else that because of the extream thinness and transparency of its Substance it is not visible; which is the reason also that the Chyliferous and Lymphatic Vessels, when they are emptyed are hardly to be seen by any body, and therefore by the most skilful Anatomists hitherto overlook'd, whereas when they are full they are at this day easy to be found.* Add to this that in Human Bodies when dead, so thin and slender a Vessel, thorough which the serous Humour only passes, which never stays in it, may easily grow lank and flagg, and so by reason of its Transparency be hardly discernable from its neighbouring Parts.

Observation.

XXIV. *Lately, when I was more diligently examining the Navel of an Abortive Birth, of about seven Months gon or more, I obsery'd a Vein and two umbilical Arteries not twisted one within another, but that a certain thick whitish Gelly, moderately condens'd, was contain'd in the Pipe of the Navel String, carried thither, no question, through the milkie Umbilical Vessels, passing the Placenta out of the milkie Caverns of the Womb; and that the said Vessels as it were plac'd in a Triangle, pass'd directly through the Placenta, and was as it were supported by the Gelly it self.* I saw no other Vessels conspicuous in the said Pipe of the Navel-string; but when I cut the Navel-string athwart, I obsery'd in the middle of that Triangle, a little drop of Serous Liquor spurt out, and the String being a little more hardly squeez'd from the Birth outward, six or seven little drops follow'd: And these, as I perswaded my self, came out of the *Urachus* invisibly crossing the white Gelly, together with the other Vessels.

The Urine flows from the Birth through the Urachus.

XXV. *Now that the Urine flows from the Birth through the Urachus, the Examples of many grown to ripe Years sufficiently inform us, the Passage of whose Urine being stopp'd through the ordinary Channel, it evacuated through the Navel, being as it were unlock'd again.* Of which there are very remarkable Stories to be found in *Fernelius*, *Laurentius*, *Cabrolius*, *Hildan*, *Highmore*, and many others. If this happens in People that are of ripe Years, whose *Urachus* is dry'd up into a Ligament, how much rather may it be ascertain'd that the same thing happens in the Birth, in which this Vessel is more open, nor any way dry'd up. Moreover in an *Embryo* miscarried in the fifth, sixth, or seventh Month, the Bladder is always found swelling, and almost full of Urine, out of which, if the Urine were not emptied the next following Month through the *Urachus*, the Bladder would of necessity burst in a short time. For every day more or less of the *Serum* is separated in the Kidneys from the Blood, and conveighed to the Bladder, and as the Birth increases, so much the more *Serum* is separated of necessity.

Bartholin in an Error.

XXVI. *They who have not well considered these things, have subscribed to an ancient Opinion, which they endeavoured to defend with many Reasons. Among the rest* Bartholinus *writes, that in the Dissection of a very young Birth he could not find the* Urachus *to be pervious, nor could he thrust in a Probe, which was a sufficient Demonstration that the* Urachus *was not pervious.* But whoever has obsery'd the Narrowness of the *Urachus* in Men, will never wonder that a common Probe cannot be thrust into such a streight Vessel: And so much the rather, because at its exit out of the Bladder, it passes among the Membranes with a winding Channel. So that if any one could thrust in a sharper and smaller Probe, yet it would never pass directly along, but break out at the Sides of the thin Vessel. Besides *Bartholin*, *Harvey* also asserts that he never saw the *Urachus* pierc'd or containing any Urine in it. So likewise *Anthony Everard* observes that neither in Coneys, Doggs, or Hares, he ever saw the *Urachus* pierced, but always solid and impassable, and doing the Office of a suspensory Ligament. Upon which *Regius* relying, believes also the *Urachus* not to be perforable. But these Mistakes are all refuted by what has been said before.

The Opinion of Courveus.

XXVII. Claudius Courveus *obser-*

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ving that of Necessity part of the Serum must be separated from the Blood which is made in the Embryo, *and that it does not flow through the Genitals into the milkie Juice contained in the* Amnion, *with which the Birth is nourished, and believing with the rest that the* Urachus *was not perforable, he endeavours to prove that the* Embryo, *all the time that it is enclosed in the Womb, discharges no Urine out of the Bladder, but that the Bladder collects all the Urine, and is able to contain it till the Delivery.* But how much *Courveus* was mistaken, this one thing informs us that in Miscarriages of four or five Months, the Bladder is then found swollen with *Serum*, and always very full; which if it be so full in these first Months, in which by reason of the smallness and tenderness of the bowels there is less blood made, and consequently less *Serum* separated, what shall become of that *Serum* which is separated in the last Months when the bowels are stronger, and the *Serum* is separated in greater Quantity? Shall it be stuft into the bladder fill'd in the first Months? Surely the bladder must of necessity burst, before the Birth be come to be six Months in being. Beside the Infant being born, very often makes water, which is a Sign that the *Serum* flows in great abundance to the bladder, and hence also that of necessity it was evacuated out of the bladder through the *Urachus* while it was detained in the womb, by reason of the Passage of the Genitals not being then open. This also is demonstrated by the Effusion of the Serous Filth preceding the Birth, which is nothing else but this same Urine collected between the *Chorion* and the *Urinous Membrane*, which flows out upon the breaking of those Membranes by the kicking of the Birth.

The Opinion of Maurocordatus.

XXVIII. Alexander Maurocordatus *proposes quite another way for the Evacuation of the* Serum, *which abounds in the Birth. For he writes that it is not transmitted through the* Urachus, *which he asserts to be hitherto so falsly call'd, but through the Continuation of the Umbilical Vessels and the Womb, to be evacuated thorough proper Places.* But this Figment is grounded upon a false *Hypothesis*, that is, the Continuation of the Umbilical Veins and Arteries, and the womb; which we have refuted a little before. Moreover if there be no use, as he presupposes, of the *Urachus*, through what Passages, I would fain know, shall the Urine come from the Bladder of the Birth to the Veins of the Mother? Shall it return out of the bladder through the *Arteries* to the *Reins*; and from thence shall it return through the *Emulgent Veins*, to the *Vena Cava*, and Liver, and so with a contrary Stream through the umbilical Vein fly back to the Mother?

The Pipe of the Navel-string.

XXIX. *For the Security of the Umbilical Veins there is a Covering wrapt about 'em, which is call'd the little Gut, or the little Rope, or Pipe of the Navel-String; and many times the whole Production of the Navel-String together with its Vessels, is understood by the Words* Intestinulum, *or* Funiculus. This is a Membranous hollow round part, of an indifferent thickness, consisting of a double Tunicle (of which the innermost is thought to proceed from the *Peritoneum*, the outermost from the fleshy Pannicle) as well comprehending as cloathing the umbilical Vessels (In which Vessels, by reason of the blood contain'd, there are several Spots conspicuous without side of the Tunicle, from the Vein broader and darker, from the Arteries red or black and blue) with which it is twisted like a Rope: Tho' this Contorsion be in some greater, in others lesser; and sometimes we have seen the whole Navel-String contorted or twisted, the Vessels ascending directly thorough the Gelly contain'd in its Hollowness. In the hollowness of this Part there is a certain whitish Humour drawn from the little Caverns of the Womb through some little milky Vessels, and pour'd forth into this Cavity between the Umbilical Vessels, and is found diffused round about 'em, and ready to descend from thence farther into the *Amnion*.

Some few Nerves.

XXX. *It is thought to enjoy some very few Nerves like the* Chorion *and* Amnios, *for it is not altogether void of Feeling.*

Knots like little Bladders full of a whitish Juice.

XXXI. *It has in several Places little Knots, like little Bladders full of whitish Juice, which* Riolanus *thinks to be generated from a Portion of the fleshy Covering, in that part thicker for the stronger binding to-*

gether of the Umbilical Veſſels, by which means Nature took care, leſt the Blood ſhould flow to the Birth with too great Violence, and overwhelm the tender Body. But Wharton *more judiciouſly obſerves, that thoſe little Knots, are little Teats, through which the milkie Juice flowing into the Hollow of the Navel-String, diſtills into the Concavity of the* Amnion. Others believe 'em to be Dilatations or Burſtings of the Arteries, but contrary to all Reaſon, when Dilatations of the Arteries are cauſed by ſome certain Violence, but theſe little Knots are generated of themſelves; ſeeing alſo that in that part there can hardly be ſo much Violence offered to the Arteries, by which they ſhould be dilated into Burſtings. Moreover ſeeing thoſe *Dilatations*, call'd *Aneuriſmata*, are Diſeaſes of deprav'd Conformation, therefore they would not be in the Navel-String of all Births; whereas thoſe Knots are in all Births, in ſome more, in ſome leſs, and are not preternatural Tumors, nor ſo looſe as thoſe Dilatations. Add to this, that they do not, like theſe, vaniſh or flagg, upon the Effuſion of the Blood, nor are they like them, ſometimes greater, ſometimes leſs, but always of an equal bigneſs; and by the conſpicuous Spots, are equally diſtinguiſhed from the Membrane of the Navel-String, whereas thoſe *Dilatations* are not to be diſcern'd from the reſt of the Skin by any variety of the Colour. Some, but without any Ground, think thoſe Knots to be raiſed by the Contorſion of the Umbilical Arteries. And *Nicolas Hoboken*, believes that theſe Knots may be obſerved not only in the Covering, but alſo in the Veſſels included therein. And hence he aſſerts three ſorts of Knots, ſome in the *String*, others in the Umbilical Vein, and others of the Arteries themſelves. The Knots of the Rope or Tunicle, he takes to be the Protuberances of the Membrane it ſelf, cauſed by the Twiſtings of the Veins and Arteries. That the Knots of the Arteries are round or orbicular, but the Knots of the Vein, ſideways only. And he calls the Inequalities of the Largeneſs of the blood-bearing Veſſels Knots. But commonly when we talk of the Nodes of the *Funicle*, we mean only thoſe which are conſpicuous without in the Inteſtine, and preſently obvious to the Sight.

Predictions from thence.

XXXII. *From the Plenty of theſe Knots, the ſuperſtitious Midwives are wont to foretel what number of Children the married Couple ſhall have; and if there be very few Knots, then forſooth they pronounce Barrenneſs for the future.* By their Diſtance one from another they judg of the Intervals between Child and Child, and by the variety of the Colour, of the Difference of the Sex, and foretel many things as to the Proſperity or ill Fortune of the Infant. Which is not only familiar among our modern Midwifes, but ſeems to have been formerly practiſed by Phyſicians themſelves; for that *Eucharius*, *Rhodion*, and *Avicen*, make mention of theſe kind of Knots.

The cutting of the Navel-ſtring.

XXXIII. *The Navel, when the Infant is born, is ty'd with a ſtrong Thread near the* Abdomen, *and about two or three Fingers breadths from the Ligature is cut off and ſo left, till what remains beyond the Ligature, being dry'd up or putrified, falls off of it ſelf, and the Exit out of the* Abdomen *be cloſed up with a ſtrong Skin drawn over it.* From that time forward thoſe Umbilical Veſſels within the *Abdomen* of the Infant, degenerate into Ligaments, tying thoſe Parts from whence they proceed to the Navel.

When cut to be left of a juſt Length.

XXXIV. *But as to the cutting of the Navel-ſtring aforeſaid,* Ariſtotle *warns us that there is great Care to be taken, which conſiſts in leaving a juſt Length.* For the Navel-ſtring being drawn too far out, and ſo ty'd exactly near the Skin, and then cut off, many believe to be the cauſe in a Male Child of ſhortning the Yard; and in a Female, of difficult Labours when ſhe comes to bring forth. But if too long a part of the Navel String be left, that the Caul will eaſily afterwards ſlip down into it, and ſo cauſe the Umbilical Burſtenneſs. The Truth of the latter we have found by Experience; but as to the former, we cannot affirm any thing of Certainty.

The Nouriſhment of the Birth in the Womb.

XXXV. *Now ſeeing that the uſe of the Navel is to conveigh the Arterious Blood through the Arteries from the Birth to the Uterine Liver, and the ſame after Preparation, together with the Maternal Blood flowing thither, again to carry through the Vein to the Birth.*

XXXVI. *Hence*

First Digression.

XXXVI. *Hence it was a thing decreed among Philosophers and Physicians, that the Birth in the Womb was not nourished by any other Nourishment than the Blood brought through the Navel.* Which Opinion seems to be confirm'd by the Authority of *Hippocrates*, who seems to be of the same Opinion. Others altogether reject this ancient Opinion, and inform, that the Birth in the Womb is not nourish'd by the Navel, but through the Mouth, and confirm their Opinion also by the Authority of *Hippocrates* who *l. de princip. & de nat. puer.* plainly writes, that the Birth in the Womb is nourish'd through the Mouth; And these believe that the *Uterine Liver* only prepares after a Specifick manner, that same Blood which forced thither through the Umbilical Arteries from the Birth it self, and so remits it through the Vein to the Birth, but that no Blood comes to the Navel Vein through the Womb.

The Birth is nourished by the Mouth and Navel.

XXXVII. *But to decide this Question so long controverted, my Judgment is, that these two Opinions are to be joyn'd together, and that we are to assert, that the Birth is nourish'd partly by Apposition, and by the Mouth, partly by the Navel.*

Nourishment by Apposition.

XXXVIII. *At the beginning before the perfect Formation of the Umbilical Vessels and the Uterine Liver, the parts delineated are increased and augmented first by Apposition out of the remaining Seminal Matter, now dissolv'd into a* Colliquamen, *upon which the little Embryo swims; in the same manner as Plants, when they first begin to germinate from the Seed, take their nourishment and growth from the remaining part of the Seed;* as we see in Onions hung up in the Air, which send forth their Leaves upward, and cast forth their Roots downward; and the same thing we find to be done in *Pease* and *Beans*, germinating without the Earth in a moist Air: For this matter is already prepared for the nourishment of the Birth, neither has it need of any farther concoction, as being most natural to the tender parts already delineated, Thus first of all the Birth is nourish'd by the Apposition alone of the Seminal Dissolution, after that, partly by Apposition, and partly by some part of the Seminal Dissolution taken in at the Mouth, and first chang'd into Blood in and from the Heart.

Nutrition by the Mouth and Navel.

XXXIX. *But afterwards, the Bowels being somewhat corroborated, and the Seminal Dissolution being for the most part consum'd, and the Uterine Liver being come to greater perfection, the Navel with its Vessels being extended to it, and thence the milkie Juice now largely flowing into the* Amnion, *the Birth is nourish'd by the Mouth and Navel.*

The three ways of the nourishment of the Birth, are prov'd by most solid Reasons.

The proof of Nourishment by Apposition.

XL. *Nutrition by Apposition which is the first of all, appears from the swift Increase of the parts, whereas as yet the Bowels are so tender and weak, that they cannot contribute so much Blood to so swift a Nourishment.*

Proof of Nourishment at the Mouth.

XLI. *Nourishment at the Mouth is proved by six Reasons.*

1. Because the Stomach of the Birth is never empty; but full of a Milkie whitish Liquor, and a Juice like to it is always contain'd in the Mouth of it; as is to be seen in Brutes. The same thing happens also in a Chicken while it sticks in the Egg, in the Mouth and Craw of which there is a certain matter like coagulated Milk; that is, from the white of the Egg taken in at the Mouth.

2. Because there are Excrements contain'd in the Gutts, which the Infant born evacuates at the Fundament. Which without doubt are the remainders of some nourishment taken in at the Mouth; whereas such Excrements could not abound in the Guts from Blood alone; which some nevertheless have maintain'd contrary to reason, who are refuted by *Riolanus*.

3. Because the Stomach presently after delivery, could not so soon go about its Office of Concoction, had it not bin at all accustomed to it in the Womb.

4. Because the Birth could not undergo so great a change without a manifest prejudice, as that having bin nourish'd in the Womb for so many months with Umbilical Blood alone, so soon as born, it should immediately, and as it were at a jump, be nourish'd by Milk taken in at the Mouth, and swallowed down into the Stomach.

5. Because an Infant is no sooner born, but it understands to suck the Nipples, which it could never do, had it not bin accusto-

accuſtomed in the Womb to take in ſomething at the Mouth, either by ſucking or chewing.

6. For that not a few new-born Infants puke up a Milkie nouriſhment, before they have ſuckt the nipple, or taken in any thing at the Mouth forth of the Womb; which could not be in their Stomachs, unleſs they had taken it in at the Mouth of the Womb. A manifeſt Example of this I ſaw in my youngeſt Daughter *Joane*, who an hour after ſhe was born, puk'd up a great quantity of white Milk, to the Admiration of all the Women that were preſent; in regard the Infant had not then either ſuck'd the Nipple, or taken in any thing at the Mouth.

Obſervation.

XLII. Harvey de gener. *proves this Nouriſhment by a ſtrong Argument taken from ſucking. The Birth*, ſays he, *ſo ſoon as, nay before, it is born, ſucks, as if it had done it for ſome time in the Womb. Having try'd it as yet ſticking in the Birth before it could either cry or breath, it has taken hold of, and ſuckt the finger put to the Mouth of it.*

An Argument from ſucking.

XLIII. *This Nouriſhment is alſo confirm'd by the Authority of* Hippocrates. lib. de Carn. *where he ſhews it to be done, by Arguments drawn from the Dung, which Infants evacuate as ſoon as born, and the firſt taking of the Nipple.*

Confirm'd by Hippocrates.

XLIV. *If any one ſhould ask with what ſort of Nouriſhment it was nouriſh'd at the Mouth: We have ſaid enough already as to that point; that is to ſay, firſt of all with the diſſolved Seminal Liquor, afterwards with the milkie Juice contained in the Cavity of the* Amnion. This milkie Juice *Harvey* found in the Stomach of an Abortion: And *Olaus Rudbeck* has this Obſervation concerning this matter. *Having diſſected*, ſaies he, *all the Kittens of one Cat, we found in the Mouth, Stomach and Gullets of every one a Mucilage and Viſcouſneſs like to that which was within the Body and the* Amnion.

With what matter it was nouriſhed at Mouth.

XLV. *Now this ſame Juice is by degrees taken in at the Mouth by the Infant and ſwallowed, not forced into it; for by that means ſuch a quantity would flow into the Mouth of it, that the Stomach would in a ſhort time be diſtended, and prejudice the Infant.* Not that there is any reaſon to fear with *Hennigius Arniſeus*, leſt the Birth ſhould be choak'd by the copious Liquor wherein it ſwims, ſhould it open its Mouth; for in regard that it does not breath in the Womb, it draws nothing within the Lungs; and if it ſhould breath, it would be as ſoon ſtifled, with the Mouth ſhut as open.

Taken in by degrees and ſwallowed, not forc'd.

XLVI. *Here* Nicholas Hoboken *puts the Queſtion, whether the Birth takes in that firſt Nouriſhment, by ſucking or only by ſwallowing, without any foregoing or joynt Act of ſucking.* But this is a doubt of no ſuch great Moment to require a laborious Solution. For when any liquid thing is taken in at the Mouth to be ſwallowed, after the common manner of ſpeaking, it is ſaid to be taken in by ſucking or ſupping, whereas many times it is done neither way, only it is pour'd into the Mouth, and ſo ſwallowed. And ſo there is no queſtion, but that the Alimentary Liquor ſlips into the Mouth of the Birth; In the mean time it is likewiſe as probable, that the time of delivery approaching, the ſame thing is done as it were by ſipping, and ſo ſwallowing; whence it comes to paſs, that the Birth being accuſtomed to that kind of ſipping, as ſoon as it is born, ſtriving to ſip, eaſily learns the way, and manner of ſucking. Which was *Harvey's* Opinion; *de gen. Animal. If the Embryo*, ſays he, *ſwimming in the ſaid Liquor, opens its Mouth, of neceſſity the water muſt enter its Jaws, and if it move other Muſcles* (which is known by its motion in the Womb, which may be felt without by the hand) *what if we ſhould think it to be the ſame uſe of the Organs of the Jaws to ſup up that Liquor?* But that he may the better deſcribe the ſame manner or Action of ſupping, and that it does not touch the Liquor, by drawing it toward the inner parts of the Mouth, he adds the manner how the new-born Infant begins the Action of ſucking. *Neither*, ſays he, *does the Infant ſuck, by compreſſing the Nipple with its Lips, as we by ſupping, but as if he would ſwallow it, he draws it all into his Chaps, and by the help of his Tongue and Pallate, as it were by chewing, fetches out the Milk.* For while he endeavours as it were to chew, he ſucks in the ſame manner as he did in the Womb. And this is that manner of ſucking which *Hippocrates* means, when he writes, that the Birth ſucks in the Womb.

A Queſtion.

Riolanus unwarily denies, that the whitiſh Liquour contained in the Stomach of

of the Birth, is the Chylous Juice, but says, it is an Excrement of the third Concoction of the Stomach: or a flegm that falls from the Head; neither of which it can be said to be. And therefore *Claudius de la Courve*, well refutes him in these words, *Lib. de Nutrit. Fœt. If in the third Month, as he observes, this Nourishment whatever it be, be generated in a certain Quantity, in how great abundance shall it be generated in the sixth, seventh, and ninth Month? But how much, if that Mucous humour contained in the Stomach be the Excrement of all the Bellies? So much, as neither the Stomach of the Child, nor the Intestines would be able to contain.*

XLVII. *The Nutrition of the Birth by the Umbilical Blood, these three Arguments chiefly prove.*

The proof of Nutrition by the Umbilical Blood.

1. The Insertions of the Umbilical Vessels into the *Placenta* annexed to the Womb; into which out of the Body of the Womb, the Maternal Blood flows through the open'd Orifices of the Vessels; and is therein prepared, and so conveighed through the Vein to the Birth.

2. The great quantity of Blood ascending through the Umbilical Vein to the Birth; within a living Animal, by tying the Navel string with a thread, and pricking the Vein between the Ligature and the *Placenta*, is presently seen: Whereas but very little can be forced through the small Umbilical Arteries, from the Birth toward the *Placenta*, for that four times as much is drawn out of the *Placenta* through the Vein, as is carry'd through the Umbilical Arteries.

3. Necessity: For the Birth encreasing wants much Nourishment; but its tender and weak Bowels can concoct and prepare but Little; hence it requires some purer and already concocted Nourishment, by which it may be speedily nourished, and by its admixture the Nourishment taken in at the Mouth, may be chang'd into Blood. Moreover in an *Embryo* the *Chylus* taken in at the Mouth, ought not to come alone to the Heart, but mixt with the Venal Blood, as in Men born it is carryed to the *Subclavial* Veins, and in them and the *Vena Cava* is mixt with the Venal Blood, endued with a fermentaceous Quality, and so comes to the Heart.

It is carryed in the same manner in a Chicken.

XLVIII. *This Nutrition seems to be carryed on in the same manner in a Chicken, whose bill adheres to the White; but its Navel string or its Vessels enter principally the Yolk; which is instead of the Mothers Blood prepared in the Uterine Liver.*

But the more the Pullet increases, so much the more the inner white abates, truly supplying the place of the Female Seed, which the Chicken consumes by little and little with its bill lying in it. Now that being for the most part consumed, the outward white is also consumed, supplying the place of the Milkie Liquor. And then also the Yolk is manifestly wasted, as being that into which the Umbilical Vessels are inserted; the Vein of which is a Branch of the *Porta*. Which is an apparent sign, that the chicken at the beginning tender, and requiring less Nourishment, is nourished at first with the inner White only by apposition, then by the Mouth. Afterwards when it wants more copious Nourishment, then it is also nourish'd with the Exterior White at the Mouth, and also with the Juice of the Yolk by the Navel. And the like procedure and order of Nourishment, happens in Human Birth; which before the sufficient perfection of the *Uterine Liver*, and *Umbilical Vessels*, and while the parts are yet very tender, is nourished with the Seminal Colliquamen, remaining after the Delineation of its parts; afterwards wanting a more copious quantity of Nourishment, the *Uterine Liver* now increasing, the Umbilical Vessels being perfected, and the Milkie Vessels extended to the pipe of the Navel-string, and the *Amnion*, it is Nourished with the milkie Juice at the Mouth, and with Blood by the Navel, and so at that time enjoys a double nourishment, out of which being mixt together, perfect Blood is made in the Heart. For at the first the Seminal Dissolution sufficiently nourishes the *Embryo*, as being most analogous to it, and nearest to its Original, and already prepared, and wanting little Concoction. But afterwards, when the Dissolution being consumed, the Birth comes to be nourish'd with the milkie Juice, which is less Analogous to it, and therefore has need of some Concoction in the Stomach and Heart, then of necessity, some other former Juice must be mixed with that Juice in the Body of the Birth, endued with a certain fermentaceous Quality, which when it cannot be performed by the over weak Liver of the Birth it self, of necessity it must be drawn through the Navel from the *Uterine Liver*. *This Nourishment proceeds in like manner in Plants.* For Examples sake, throw a Branch of a Willow into a Pond, first it is nourish'd with

with only Viſcous water, in the mean time beſides Leaves it caſts forth Roots from it ſelf to a certain length, ſo that at laſt they reach the Earth, and inſinuate themſelves into it; and ſo from thence receive a firmer Alimentary Nouriſhment, which cauſes the Willow to ſhoot out in bulk. Thus alſo the *Embryo* is for ſome time nouriſhed with a Seminal *Colliquamen*, and a more *ſerous milkie Juice* taken in at the Mouth, in the mean time the Roots of the *Umbilical Veſſels* from its Navel-ſtring, put themſelves forth till at length they extend themſelves into the *Placenta*, as it were into the Earth, and ſo from thence receive a firmer Alimentary Juice, prepar'd therein, and conveigh it to the Birth, for its ſwifter and larger Growth.

Theſe things thus ſaid enjoyn Silence to *Riolanus*, who concludes that the Birth is Nouriſh'd only by the Navel. *But*, ſays he, *the Birth being every way ſurrounded with Waters, if it ſhould take its Nouriſhment in at the Mouth, it could not be but that it muſt ſwallow its own Urine again together with its Nouriſhment. Theſe more modern Authors have obſerved, that neither the Mouth nor Noſtrils are open in an* Embryo *four Months gone. For which reaſon we acknowledge no other way of Nouriſhing the Birth, but by the Umbilical Vein, that conveighs Blood to the Liver.*

Riolanus *deceived.*

XLIX. *But* Riolanus *together with the Ancients was deceived in that, becauſe he minded not the Difference of Subſtance and Place; between the milkie Juice incloſed in the* Amnion, *and the Urine without the* Amnion, *contained between the* Urinary Membrane, *and the* Chorion. *As alſo for that without any farther Inquiſition, he admitted a falſe Propoſition, grounded only upon the Opinion and Relation of others, as moſt true, that the Mouth of the Birth continu'd ſhut till the four Months end.*

What has been ſaid, may ſuffice to convince *Claudius Courveus* alſo, who by many reaſons endeavours to maintain, that the Birth is by no means Nouriſh'd with the *Umbilical Blood*, but only with the Liquor of the *Amnion*, whoſe vain labour in the Proof, any one may ſee that reads his Book.

Whether Tapping in a Dropſie, may not more ſafely be done in the Navel it ſelf.

L. *But before we leave the Hiſtory of the Navel-ſtring, there is one thing to be inquired into that concerns Phyſical Practice, that is to ſay, ſeeing that Aſcitic Dropſies are frequently cured (according to the Directions of* Hippocrates *and other Ancient Phyſicians, and the conſent of Experience) by tapping which is uſually done a little below the Navel, ſomewhat toward the Right or left ſide, the Queſtion is, whether that tapping may not be more ſafely begun in the Navel it ſelf, to the end the Serum included within it may flow out. Andrew Laurentius*, with whom *Bauhinus* conſents, maintains the affirmative with ſo much heat, that he prefers the opening of the Navel far before the other way of Tapping, and affirms that the included Serum may be eaſily evacuated through the Umbilical Veins. This Opinion of his he confirms with four Stories of *Aſcitic* Patients, of which three were perfectly cur'd by the breaking of the Navel of its own accord, the fourth by the Artificial opening of it. Then he adds not only the manner of the Operation, but alſo divers reaſons to uphold it; of which the firſt is this, *Where Nature tends, there we muſt follow her, but many times ſhe attempts that Evacuation of her own accord through the Navel, therefore, &c.* But *Laurentius* miſtakes in ſpeaking ſo generally of this Section of the *Navel*, as if it were convenient in every *Aſcitis*: For we are indeed to follow where Nature tends; if ſhe ſeeks paſſages that are Natural: But ſeeing that in an *Aſcitis*, Nature ſeldom tends to the Navel, which ſwells in very few that are troubl'd with that diſtemper, therefore that Operation is not convenient generally in all, but only in ſome few. For in others whoſe Navel does not ſwell of its own accord, that Section would be not only unprofitable, but alſo prejudicial, ſince it would be dangerous to cut the Conſolidated Navel, where Nature intends no Evacation of the *ſerous Humours* that way, whence *painful Convulſions* muſt be expected, and a *Gangrene* greatly to be feared, eſpecially in a Body Aſcitic and full of ill Humours. Moreover if the Navel did not ſwell before of it ſelf, being opened by Art, there will nothing of the Serum flow out that way from the Cavity of the Belly; becauſe Nature does not tend that way, and therefore ſuch a ſection would be unprofitably, dangerouſly, and unadviſedly undertaken;

ken. Laſtly *Laurentius* judges erroneouſly that the *Serum* which flows out of a ſwollen Navel being open'd, flows out of the *Umbilical Veſſels*; Seeing that the *Serum* contained in the Cavity of the *Abdomen*, cannot enter the *Piſs-bladder* by any Paſſages, and to aſcend through that and the *Urachus* to the *Navel*; nor can it enter the Heart, and ſo be forced through the *Iliac* and *Umbilical Arteries*: nor can it enter the *Liver* it ſelf, and be conveighed thither from thence through the *Umbilical Vein*, by reaſon of ſeveral little *Valves* that ſtop the aſcent of all manner of liquor from the *Liver* toward the Navel: Nor can it enter the *Milky Umbilical Veſſels*, altogether dryed up, ſoon after the Birth. Therefore that Evacuation cannot be made through any *Umbilical Veſſels*, but from the Cavity it ſelf of the *Abdomen*; out of which, in ſome Aſcitics, the *Serum* collected in great Quantity, through the preſſure of the Muſcles of the *Abdomen*, ſometimes inſinuates it ſelf into the Navel, taking the ſame way through which the *Umbilical Veſſels* paſs thither, by which means the Skin being looſned in the Navel, there happens a watery humour, which being opened, the watery *Serum* flows out, yet not without danger to the Patient, ſeeing that as *Hippocrates* witneſſes, ſuch a ſuddain Evacuation is very dangerous, and it is a hard matter for the Phyſicians to ſtop it in ſuch a Caſe. *Laurentius* orders the Navel to be ty'd, or elſe to clap a Silver pipe to the hole of the Section; by which means the rapid Colours of the *Serum* may be ſtopped, and let out at the pleaſure of the Surgeon. But this advice ſavours of unskilful *Theory*; Seeing that not only Reaſon but Experience teach us, how difficult a thing it is to tye the Navel, when grown flatted upon the flowing out of the *Serum*; or to thruſt in a Silver Pipe, and keep it there; for if it be done with a Swath brought about the Loyns, it puts the Patient to more pain; if by a Ligature about the Pipe, then the part ty'd will ſuddainly dye and corrupt, and the Ligature will be unlooſed.

CHAP. XXXIII.

In what parts the Birth in the Womb differs from a Man grown.

I. *In what the difference conſiſts.*

THis Difference conſiſts in the diverſity of Biggneſs, Figure, Situation, Number, Uſe, Colour, Cavity, Hardneſs, Motion, Excrements and Strength of the Parts.

This Variety is conſpicuous either in the whole Body, or in the Ventricles, or in the Joynts.

II. *Variety in the whole.*

For the whole Body is conſiderable. 1. *The ſmall Bulk of all the Parts,* 2. *The ruddy Colour of the whole,* 3. *The ſoftneſs of the Bones,* of which many are as yet Cartilaginous and Flexible, ſo much the more, by how much the Birth is diſtant from Maturity.

III. *Difference in the Head.*

In the Head there is a great Variety of Difference.

1. *The Head, in proportion* to the reſt of the Body, is large, and the Figure of the Face nothing ſo well ordered.

2. *The Bones of the Scull* are ſofter, and the top of the Head is not covered with a Bone, but are ſpread over with a Membrane.

3. *The Bone of the Forehead* is divided, as alſo of the lower Jaw, and the Wedge-faſhioned Bone, is quadripartite.

4. *The Bone of the Hinder part* of the Head is divided into three, four, or five Bones.

5. *The Brain is ſofter and more fluid*, and the ſoftneſs of the Nerves is extraordinary.

6. *The little Bones of the Hearing*, are extreamly hard and large.

7. *The Teeth* lye hid within their Little Holes.

IV. *Difference in the Breaſt.*

In the Breaſt there is no leſs difference to be obſerved.

1. *The Breaſts* ſwell out, and a ſerous kind of Milk flows from the Breaſts of Newborn Infants, as well Male as Female, ſometimes of its own accord, and ſometimes being ſqueez'd though very gently. But no little Glandules appear conſpicuous, only there is to be ſeen ſome ſign of a little Teat.

2. *The Vertebres* want the Spiny Proceſſes, and are formed out of three diſtinct little Bones, the mutual Concourſe of which forms a hole, which

admits the descending Spinal Marrow.

3. *The Heart* is more conspicuous in biggness, and furnished with larger little Ears.

4. *There are two Unions* of the Bigger Vessels, not conspicuous in grown People, *viz.* an Oval Hole through which there is a passage open out of the *Vena cava* into the *Pulmonary Vein*, fortified with a *Valve* by a part of this Vein, and a Channel extended from the *Pulmonary Artery* into the *Aorta*.

5. *The Glandule* under the Channel-bone adhering to the Vessels, appears of an extraordinary Bigness, and as it were with a threefold Little Glandule.

6. *The Lungs* are ruddy, thick and bloody, and heavier than usually, so that being thrown into water, they presently sink.

Difference in the lower Belly.

V. *The difference in the lower Belly, consists in these things.*

1. *The Stomach* is more contracted; though not empty, but full of a Milky Liquor.

2. *The Umbilical Vessels* go forth of the *Abdomen*.

3. *The Cawle*, hardly conspicuous looks like a Spiders Webb.

4. *The Intestines* equal or exceed the length of the little Body seven times.

5. *In the Thin Guts* are contained flegmatick and yellow Excrements; in the Thick Guts, hard and blackish; and sometimes Greenish.

6. *The huge Bulk of the Liver* not only fills the right *Hypochondrium*, but extends it self to the left side, and so covers all the Upper part of the Ventricle.

7. *The Spleen* is very small.

8. *The Gall Bladder* swells with the yellow or green Choler.

9. *The Sweet-Bread* shews it self remarkably large and white.

10. *The Kidneys* are vaster in Bulk, and seem to be composed of a Cluster of many Kernels.

11. *The Suppositious Kidneys* are also very large, nor do they lye nigh the Kidneys, as in grown People, but rest upon the Kidneys, and encompass the upper part of them, as it were with a large bosom.

12. *The Ureters* are wide, and the Bladder distended with a great quantity of Urine.

13. *In Females, the Womb* is depressed, *the Tubes* longer, and *the Stones* conspicuous for their largeness.

Difference in the Joynts.

VI. *In the Joynts there are these differences to be observed.*

1. *In the tenderness and softness* of the Bones.

2. Because the *Little Bones of the Wrist and the Back of the Foot* are gristly, and not firmly joyned.

CHAP XXXIV.

Of the Situation of the Birth in the Womb.

WHen I take out a mature Birth out of a dead Mother, I cannot but admire how, so *large a Body* should be contained within so *small a Prison*, and move it self, which being once drawn forth, no Art of Man can thrust in again. Now therefore let us observe how the Birth is contained in the Womb.

How the Birth is contained in the Womb.

I. *The Situation of the Birth is not always alike, but many times found to be various, which proceeds partly from the Birth it self, partly from the time that the Woman has gone, and her growing near the Time of her Delivery.*

The *Head* is contained in the upper part of the Womb, with the *Arms* and *Thighs* contracted together, the *Knees* neareſt the *Elbows*, the *Hands* in some plac'd upon the *Knees*, in some upon the *Breast*; in others folded together; the *Feet* are turn'd back inward, so that they touch the Buttocks with the Soles, rarely with the Heels. Whence it comes to pass, that the Legs of Newborn Infants are bow'd inward, and their Feet in the same manner, which fault is easily afterwards amended by swathing, by reason of the softness of the parts. Sometimes the Birth lies toward the side, and assumes to it self an overthwart Situation, which is easily perceived by the Woman laying her hand upon her Belly, as also by the swelling out of the side, and the weight falling that way.

The Inversion of the Birth.

II. *Sometimes, one, two, or three weeks before Delivery, the Birth turns it self with the Head downward, and lyes much more toward the Lower, preparing for its* Exit; which tumble is performed in a short time, though not without some trouble to the Mother, who takes that alteration for a certain Sign of her approaching Labour.

Change of Situation.

III. *About the time of Delivery the Birth changes its Situation several ways; while by kicking and moving its*

it self to and fro, it seeks to come forth. Hence I believe it is that several excellent Anatomists, who perhaps have viewed such kinds of Births in Women at such times Deceasing, do not agree in the Manner of the Situation of the Womb in the Birth; while some describe the Arms, others the Thighs, or other parts after this or that manner situated in this or that place.

The Opinion of Fernelius.

IV. Fernelius *asserts that there is a different Situation of Males and Females; affirming that Males lye with their faces toward the* Abdomen *or inner parts, and Females quite the contrary; and that hence it is, that the Bodies of drowned Women swim with their Bellies downward in the Water, and Men upon their Backs. Which Opinion* Riolanns *derides as ridiculous, and without reason.*

Charles Stephens reports, that Twins observe a contrary Situation; and that one looks toward the forepart, the other toward the hinder part. But this Rule is uncertain, as is apparent from hence; for that sometimes Twins have bin born with their *Abdomens*, *Breasts*, or *Foreheads* growing together, which could never happen if they lay back to back.

CHAP. XXXV.

Of the Delivery.

Digression. How long the Birth remains in the Womb.

I. *THe Birth being conceived in the Womb, abides within that dark Domicil, till it comes to Maturity; that is, till it has acquir'd strength anough, so soon as it is set at Liberty, to endure the Violence of the Air and the Alteration of Nourishment. But how long it is, before it acquire that Maturity, and how long it is before it ought to come into the World, is disputed among the Learned.* That there is a certain time prescribed by Nature to all other Animals is vulgarly known; so that the Contest is only concerning Man.

Hippocrates and *Aristotle* seem to ascribe no certain time to the Birth of Man; for they affirm that a Woman may bring forth from the Seventh to the Eleventh; with whom agrees the greatest part of the Crowd of Physicians. But most commonly Human Births are detained in the Womb nine whole Months together, before they come to their just Maturity; which Maturity nevertheless may sometimes happen in seven Months: So that within both those times Women may be delivered of Sound and Mature Children. Such as are born before the seventh Month, are not ripe, neither can they be preserved alive; because they cannot brook the violence of the Air, nor Alteration of Nourishment: Wherefore, says *Aristotle*, *The Birth that comes forth sooner than the seventh Month, is no way to be preserved alive.* But because there has happen'd an Exception to this General Rule of *Aristotle's*, I think that instead of *by no means*, he should have written *very seldom.*

Children born within the sixth Month.

II. *For that some have lived that have been born before the seventh Month, the Relations of Physicians testifie.* *Avicen* reports, that he saw one born within the sixth Month, that lived well: *Cardan* writes that the Daughter of *Peter Soranus*, being born in the sixth Month grew up to Maturity. *Spigelius* writes, that in *Zeland* he knew a certain Letter-Carrier, who by the Publick Testimony of the City of *Middleburgh*, under the Certificate of the Magistracy, was born in the sixth Month, so small, so tender and weak, that he could not endure Swathing; but was wrapt up in Cotton to defend him from the Cold. We also knew a Girl that was born within the sixth Month, whose Head when she was born, was no bigger than a large Apple, and the whole Body so small, that the Nurse could hardly touch it, nor could it be Swathed according to the usual manner; which afterwards grew up to a just proportion, and is now at this time living about eighteen years of Age.

Children born in the fifth Month.

III. Montuus *reports that he knew a Cupbearer to* Henry *King of* France, *who though he were born in the fifth Month, yet lived to a florid Age.* Francis Vallesius *tells us of a Girl born in the fifth Month, that he knew when she was entring into her twelfth year. In like manner* Ferdinand Mena *makes mention of two that were born in the fifth Month. But certainly this is to be understood of the end of the first Month.* And so all these Examples quoted from Men of Credit, and confirm'd by their Testimonies, sufficiently demonstrate, that sometimes a Child born before its time, may be so

cherisht and hatched up by Care and Art, as to be preserved alive. But these are accidents that rarely happen, from whence no certain Conclusion can be drawn. For it's a wonder, when a Birth so immature, so tender, and so weak, happens to live any time.

They cannot live that are born in the eighth Month, according to Hippocrates.

IV. Hippocrates *also denies that they can live who are born in the eighth Month: Perhaps because he often observed it so to fall out in* Greece. For which *Regius* gives this Reason; because that the Birth being a certain Critical Evacuation, it cannot be done safely and soundly but in a Critical Month; such as is the seventh: So that if that *Crisis* of the Birth happen in the eighth Month, then of necessity some powerful preternatural Cause must intervene, so much to the prejudice of the Infant, that it cannot live. But if only the Critical Months, the seventh, fourteenth, *&c.* are only to be accounted wholesom, what shall we say to a Birth of nine Months, which however is no Critical Month, and yet most frequent and most wholesom? What to the Tenth Month? Certainly there is no Effervescency of the Body of the Infant, as there is of the Humours, which boyl at certain times, and break forth Critically? And therefore since there is no solid Effervescency in the solid parts of the Birth, neither is there here any bad or good season of Critical Evacuations to be observed, and thence no reason that Children born in the eighth Month, should be thought less likely to live, than those that are born in the seventh; seeing that dayly Experience teaches us, how that Children born in the eighth Month, live as well as they that are born in the seventh. For if they are born in the seventh Month, and can be ripe so soon, why not in the eighth? why shall not the latter brook the Violence of the Air, and the change of Nourishment as well as the former? rather, why not better, seeing they are more mature. In vain do many here alledge the great toil and tumbling of the Birth in the seventh Month more than in other Months, by which he is so weakened and tvr'd, that he cannot brook the Labour of Expulsion in the Eighth: for these are idle Dreams refuted by the Women themselves, who assure us that they perceive that extraordinary Motion no more in the seventh, than in the sixth or eighth, As vainly others fly to the numbers of Days, Hours, and Minutes, confining the Exit of the Child to certain numbers, when the incertainty of the days of delivery frequently delude those Numbers. Lastly, the Astrologers in vain endeavour to reconcile this matter by the benigne or malign aspects of *Saturn*, as if *Saturn* rul'd always; or at least that there were no Children born in the eighth Month, but under his Reign; whereas such Births frequently happen under the Dominion of other Benign Planets, which seem to be secured from *Saturn*'s Injuries by their Clemency and Benignity. Besides, As to the Influences of the Stars, how unknown and meerly conjectural they are, not only the fallacious, uncertain, and contrary Judgments of Astrologers so frequent in their Writings demonstrate, and of what little Prevalency and Efficacy they are, experience teaches; so that whether they have any power over things here below, is not without reason questioned by many. And hence though many, in explaining the meaning of *Hippocrates*, *Concerning the Children born in the eighth Month, by him pronounced short-liv'd*, have laboured very much, and have studyed to underprop and adorn his Sentence with many fictions and pretences of Truth, yet not only frequent and daily Observation, but the Authority and Experience both of the Ancients and Moderns overturns all they have rear'd beyond the Limits of *Greece*. For *Galen* says, they are in a very great Errour, that will not acknowledge the eighth Month for a due and natural time of delivery. In like manner *Aristotle* asserts that Children born in the eighth Month live and grow up. Nevertheless he adds that the words of *Hippocrates* may be interpreted in the best Sence. *But many dye in several places of* Greece, *so that very few are preserved: So that if any one there doth live, he is not thought to be born in the eighth Month, but that the Woman has mistaken her reckoning.* *Pliny* writes that in *Egypt* and *Italy*, Children born in the eighth Month do live, contrary to the Opinion of the Ancients, and that *Vastilia* was happily brought to bed of *Cæsonia*, afterwards the Wife of *Caius*. Among our Modern Authors, *Bonaventure* saw three safe that were born in the *eighth Month*. So it is credibly reported, that the Learned *Vincent Pinelli*, together with his Sister, were born Twins in the *eighth Month*, as was also Cardinal *Sfondrati*, and both his Sons. *Cardan* brings *five Examples* of great Men all born in the *eighth Month*, who lived; and asserts moreover, that in *Egypt* generally they live that are born in the *eighth Month*. Which if it has befallen so

ſo many Princes, we may eaſily conjecture that the ſame as frequently happen among the ordinary People, who ſeldom reckon ſo exactly. *Riolanus* relates that in the *Iland Naxus* the Women are uſually brought to bed in the *eighth Month*: and *Avicen* gives the ſame Relation of the *Spaniſh Women*. We find the ſame to be true in *Holland*; and that it is ſo likewiſe in *France*, *England*, *Scotland*, and all the Northern Countries, is very probable, becauſe we never hear of any complaint againſt the *eighth Month* in any of thoſe places.

The reaſon of the variety in the time of Delivery.

V. *Now the reaſon why ſome are born in the ſeventh, ſome in the eighth, and others in the ninth Month, is to be aſcribed to the difference of Regions, Seaſons, Dyet, Paſſions of the Mind, Temperament of the Seed, Womb, and Woman her ſelf, by means whereof the heat of the Womb increaſes ſometimes later, and ſometimes ſooner; So that ſometimes there is need of a ſwifter, ſometimes a ſlower Ventilation.* *Paulus Zachias* ſeems to accuſe *Hippocrates* and *Ariſtotle* of a *Miſtake* for appointing ſo many uncertain limits for ſound Delivery: and believes that there is a certain time for the Delivery of Men as well as of Beaſts; that is to ſay, the end of the ninth, and beginning of the tenth, and that all other Births either on this ſide, or on that ſide, are all preternatural, occaſion'd by ſome Morbifick Cauſe, which is the reaſon of ſo many weak and diſtempered Children. Which if it were true in thoſe that are born before the nine Month Term, then certainly the Mother or the Child would be affected with ſome Morbifick cauſe, either before or after the Birth; whereas in Children that come in the *ſeventh Month*, which frequently happens, any ſuch bad affection rarely happens, but that the Mother and the Child equally do well, as if the Birth had bin delay'd till the end of the *ninth Month*; nor is the Child more ſickly or weaker, than thoſe that are born at the end of the *ninth Month*, which are many times as ſickly and weak, as thoſe that are born in the ſeventh. Now as to thoſe that are born beyond that Term, it has been controverted among ſeveral, whether any ſuch thing happen, and whether a Woman bring forth after that time. In the mean while, it is a Rule hitherto held certain, environ'd with many probable reaſons, and the Authority of great Men, that ſome Women may be brought to bed in the eleventh, twelfth, thirteenth, and fourteenth Month, and that the Children are duly born, by reaſon of the weakneſs of the Infant, or the Mother; the Coldneſs of the Womb, ſcarcity of Nouriſhment, or ſome ſuch like cauſe, which may occaſion Nature to delay the Appointed time of Birth, as many famous Philoſophers have perſwaded themſelves and others: *Hippocrates* expreſly aſſerts that Children are born in the *eleventh Month*. *Ariſtotle* admits the *eleventh* and no farther, *They that lye longer than the eleventh Month, ſeem to lye hid*; that is, that the Mother has miſtaken her Reckoning. *Petrus Aponenſis*, otherwiſe called the *Conciliator*, by the Report of *Cardan*, aſſerts himſelf to have been born in the *eleventh Month*; as if he had kept his Mother's reckoning in her Womb. *Homer* makes mention of one born in the *twelfth Month*. *Pliny* ſpeaks of a certain Woman that was brought to bed in her *thirteenth Month*; and *Avicen* of another that was brought to bed in her *fourteenth*. Of which we have another Example in *Alexander Benedict*; I omit other Women that went two and twenty Months; nay ſome that went two, three, four whole years, of which *John Schenkius* quotes Examples, I fear me too fictitious, out of ſeveral Authors.

Paulus Zachias.

Learned Men too much deceived by old Womens Tales.

VI. *But indeed theſe are all idle Stories without any grounds, and prov'd by no certain Experience, but taken up from the diſcourſes of tatling Goſſips, to whom ſome overcredulous Learned Men have given too much Credit, to the end they might underprop theſe Vanities with ſome ſupports of probability.* For as I believe it to be moſt certain that the time of delivery may be for certain cauſes delay'd ſome few days beyond the Term of *nine Months*, ſo I believe it impoſſible that it ſhould be put off one, much leſs many Months, ſeeing that in whatſoever Conſtitution of a Woman, the Increaſe of heat becomes ſo great in the Infant, that it requires Ventilation by Reſpiration; and for that cauſe the Birth muſt ſeek relief without the narrow ſtraits of the Womb. So that it is manifeſt theſe ſerious maintainers of that Opinion drew too haſty a Concluſion from the falſe Relations of ſilly Women. For if we narrowly prie into the Matter, there lies a Snake in the Graſs; either wickedneſs in the Woman, or ſimple Error in the Reckoning. Wickedneſs in the Woman;

man; Who if ſhe have no Children, upon the death of her Husband, that ſhe may enjoy her Eſtate, leagues her ſelf with another Man, and being by him got with Child, pretends to be delivered, Eleven, twelve, thirteen Months after the death of her Husband, that ſo ſhe may lay the Child to him in his Lifetime; which is a ſort of wickedneſs ſo frequent, that the Courts are full of theſe Contentions: Which is the reaſon that theſe lateward Births ſeldom happen but among ſuch kind of Widows, rarely among Women that live with their Husbands. There may be alſo a ſimple Error in the Reckoning, for that Women generally compute their Reckoning form the firſt ſuppreſſion of their Flowers: though it may happen from other cauſes that their Flowers may ceaſe three or four Months before Conception. So that if a Woman begin her Reckoning from the firſt Suppreſſion, ſhe muſt of neceſſity miſtake, and through that Miſtake the Child ſhall be ſaid to be born in the eleventh or twelfth Month, that came at the appointed time of the end of the Ninth. *Ariſtotle* believes that Error may proceed from the ſwelling of the VVomb. *Women*, ſays he, *are ignorant of the Time of their Conception, if when the Womb was fivelled before, as it often happens, they afterwards lye with their Husbands and conceive, for they believe this to be the beginning of their Conception, becauſe it gave ſuch a Signal.*

Error in Womens Reckonings.

VII. *Through the ſame Error in Reckoning, Children are ſaid to be born in the fifth or ſixth Month, which nevertheleſs are not born till the Ninth.* For that ſome VVomen for the firſt two or three Months of their being with Child: have their Flowers upon them ſtill at the ſet times; but afterwards they ſtop; and ſo they begin their Reckoning from that Suppreſſion wherein they greatly err, beginning their account from thence, when they are three or four Months gone: and ſo a Child ſhall be ſaid to come in the ſixth Month, that was duly born in the ninth, and this Error is apparent from the juſt proportion of the Child, and the ſtrength of its parts.

What happens near the time of Delivery.

VIII. *When a Woman draws near her time, the Birth turns it ſelf, and the Head declining, plants it ſelf before the Privity, diſtending upwards the reſt of the Body: Which turning happens a week or two before the delivery.* Then the Orifice of the VVomb, like a blowing Roſe begins to open and dilate it ſelf, and to prepare a paſſage for the Birth that is about to come forth; moreover the Infant kicking and ſprawling to and fro, breaks the Membranes wherein it is infolded, and ſo the humours included therein flow forth, which looſen the Privy parts, and render the Paſſages ſlippery; to make the paſſage eaſie for the Birth to paſs thorough. For it rarely happens that the Child is born and comes into the VVorld with the Membranes whole and entire, which once I ſaw in an Infant that was very weak.

The cauſe of Expulſion.

IX. *This ſprawling is painful to the Womb, and this pain communicated to the mind in the Brain, preſently the Animal Spirits are ſent in great Quantity through the Nerves to the purſing Fibers of the Womb, and the Muſcles of the Abdomen, which being contracted together, cauſe a ſtrong Expulſion of the Birth.*

A natural Birth.

X. *The Infant comes forth with the Head formoſt according to Nature,* ſays Hippocrates. Lib. de. nat. puer.

Unnatural.

XI. *Whatever other manner it offers it ſelf to come forth in, that Birth cannot be ſaid to be Natural; and the more hazardous it is, by how much the poſture of the Child is more unuſual.* For if it offers one Thigh or one Arm, it makes a ſtop, unleſs that Member be thruſt back and the Birth turn'd. If two Thighs be offered together, the delivery may go forward, but with great difficulty, if the Buttocks offer themſelves firſt, the delivery goes not forward, unleſs very ſeldom, ſometimes the Birth comes forth doubled, but with great difficulty and great danger. If the Sides or Belly offer themſelves firſt, the Delivery is impoſſible.

How the mature and large Birth ſhould be able to paſs through the Straits of the Bones of the *Pelvis*, ſtuft with Muſcles and other parts, *Galen* admires, but dares not explain. But it is done, by reaſon that the Bones of the Share, the *Os Sacrum*, and the Hip-Bone, their Cartilages being looſen'd, ſeparate a little one from another, as we ſhall ſhew more at large. *L. 9. c. 16.*

Nature expels the Birth out of the Womb through the Uterine Sheath.

XII. *However it be, or at whatever time the Delivery happens, Nature expels the Birth out of the Womb through the Uterine Sheath, or at leaſt endeavours to do it, and that is the only paſſage appointed for the Expulſion*

pulsion of the Birth. I say, *or at least endeavours to do it*: for sometimes it happens, that that same passage being stopt, the Child cannot be expell'd by Nature, but must be drawn forth by the skill of the Surgeon; and that through the passage already mentioned by the hand, either of the Midwife or Surgeon, or by the Assistance of Hooks, which we have tryed with success in many Women, or else by Section made in the Womb and *Abdomen*, which is called the *Cæsarian Delivery*, concerning which *Francis Rousset* has written a famous Treatise. But it is rarely seen that Nature her self attempts Expulsion, through unwonted Passages. Of which nevertheless *Bartholin* relates a most Remarkable Story, *Lib. de insolit. part. viis.* Of a Woman that evacuated several little Bones of a Human Birth, first of all out of her Navel swelling and dissected, next out of an Ulcer in her left *Ilium*, and this not all at once, which increases the wonder, nor all together, but at several times, and at several years distance; and those so many, that it was thought they were enough now for the Bodies of Twins. To which Story he adds a long and splendid Explanation; and moreover out of several Authors brings many other Examples of corrupted Births, evacuated out of the Navel, *Hypochondriums*, *Ilium*'s open'd, the Fundament, and other unusual Passages; for which we refer the Reader to *Bartholin* himself.

Some things admirable to be observed.

XIII. *In the mean time, there are the Admirable and Stupendious works of Nature, seeing that the Birth must of necessity slip into the Cavity of the* Abdomen; *through the broken, ulcerated, or any other way torn and lacerated Womb; or else the Conception in the Tube must have miscarryed thither, out of the Tube, being broken through the Thinness of the Membrane of the Tube, before it could cause those Exulcerations by its corruption in the parts of the* Abdomen. But because many such Women have been restored to their former health, this is most of all to be wondered at, that those inward Wounds and Ulcers of the Womb and Tube, should heal again of themselves, and that the Birth putrifying in that Place, should not withal putrify the Guts, Bladder, Mesentery, and other Bowels of the *Abdomen*, and rather hasten the Death of those unfortunate Women, than such an unwonted Delivery.

The cause of the kicking of the Infant.

XIV. *We are now to return to the Causes of Delivery, among which in a natural Delivery we have reckoned the kicking and stirring of the Infant, which is assigned to three Causes, that is to say, the narrowness of the Place, the Corruption of the Nourishment, and the want of it.*

Not the narrowness of the place.

XV. *The narrowness of the Place signifies nothing to the purpose: For there are many Women, who having before brought forth very large Births, afterwards are delivered of a little one, and then a great one again.*

Now the Place was big enough for that same little one to have stay'd longer, and there was Nourishment sufficient in it for its larger growth, where there had bin a great one before. Moreover as the Infant grows, so its Domicel the Womb enlarges, which if any cause obstruct, the Birth dies before matur'd, and abortion happens.

Not the Corruption of Nourishment.

XVI. *Nor can any such thing be prov'd from the Corruption of Nourishment; seeing there is no Corruption of it, but that it is as equally good at the end, as at the beginning.* If any one affirm the Urine of the Birth to be mixed with the Nourishment, we shall remit him to the preceding 30, 31, 32. Chapters. Besides, the Birth could not be rendred more vigorous, by the corruption of the Nourishment, to kick and sprawl, but weaker and more infirm. Some there are who with *Regius* add over and above, that the Nourishment becomes unpleasant to the Birth by reason of its Corruption, and therefore refusing such ungrateful Nourishment it kicks and spurns, and seeks to get forth. But there can be no Depravation of the Nourishment, and therefore this Opinion presupposes some acute Judgment in the Birth, to distinguish between the goodness and badness, pleasantness and ungratefulness of the Nourishment. But what Judgment an Infant has, I leave to any one to consider. For we find Children new born take Sack, Milk, Oyl of sweet Almonds, Ale, Syrups, powder of Bezoar, *&c.* without any Distinction, and therefore 'tis not likely it should be able to distinguish the taste of Nourishment in the Womb.

Not defect of Nourishment.

XVII. *Neither can it be defect of Nourishment which causes this sprawling; which would rather occasion weakness and immobility: for all living*

ing things languish for want of Nourishment; and motion ceasing by degrees, at length they dye. Moreover we see many Infants new born that are strong enough, and yet for the first two or three days, receive little Nourishment, which if they had wanted in the Womb, they would not have been so strong, but weak and languishing, and would have been greedy of Nourishment when offered. And to this, that in many Women with Child that have hardly Bread to eat, the Birth doth not only sprawl, but is so weak, that its motion can hardly be felt in the Womb: but let the Mother feed heartily, the Birth is refreshed, and moves briskly in the Womb. Which is a certain sign that the stronger Motion of the Infant proceeds from a sufficient supply of Nourishment, and not from want of Nourishment, which would rather retard than promote delivery.

Whether abundance of Excrements.

XVIII. Claudius Courveus *finding these causes, did not promote delivery, has contriv'd another, which is, redundancy of Excrement, which he says is sometimes so much, that the Birth constrained by necessity of Evacuation, never leaves kicking till it get forth. Which fiction of* Courveus *is contrary to Reason and Experience.* The one teaching us that there is no obstruction to hinder the Birth from Evacuating in the Womb. And it is apparent that very little Excrement can redound, in regard the Infant takes no solid Nourishment in the VVomb. Then Experience tells us, that a new born Infant does not piss all the first day, and for three days together many times never evacuates by Stool, which it would do as soon as born, were the Opinion of *Courveus* true.

The true cause.

XIX. *Therefore there must be another cause of this strenuous kicking and ensuing Labour, which is the necessity of Breathing and Cooling.* For at first the heat of the *Embryo* is but small, shewing it self like a little spark, that has no need of cooling but of Augmentation. Now this heat encreasing; the Actions and Motions of the Birth encrease. At length this Heat encreases to that degree, that it wants Ventilation and cooling: which being deny'd the Infant begins to be more and more disturbed by the heat, and through that disturbance vehemently to move and kick, and by means of that motion to excite the Uterine Humours to an Effervescency, and make way for it self into a freer Air. But that increase of heat happens also in a small Birth, which has stay'd its due time in the VVomb, as well as in a large Infant. So that the cause of Calcitration and delivery is the same in a small as in a large Infant if ripen'd in the VVomb.

A Similitude.

XX. *Thus in very hard winter Weather, suppose a Man almost nummed and frozen to death, should be enclosed and shut up in a narrow close Chamber every way stopped up; and there should be a great Fire made in that Chamber. First the heat of that place would Excite and Augment the remaining heat of the enclosed Body. Hence the enclosed Body would begin to come to himself again, and the heat would extreamly refresh and revive him. And set at liberty his benumm'd and frozen Joynts, so that he might be able to walk and eat.* But afterwards the heat of the Body encreasing beyond due Mediocrity, though he had the choicest and most plentiful Nourishment by him, he would begin to be troubled and sweat. Lastly, Extremity of heat encreasing that anxiety: he begins to turn himself every way, and violently breaks open the dore for more Air, afraid of being stifl'd.

The necessity of Refreshment and Respiration is the cause of Calcitration.

XXI. *Thus in the Birth this same necessity of Refreshment and Respiration, is the only true and chief cause of Calcitration and Delivery.* For when the heat of the Heart is so encreased, as to generate hotter Blood to be now twice dilated in both Ventricles, of necessity, it must be cool'd by Respiration in the Lungs; which Respiration being deny'd, the Infant is Suffocated, as many times it happens when it sticks in hard Labours before it can be expell'd. Now that the necessity of breathing forces the Birth to Calcitration, is apparent from hence, for that as soon as it is born and enjoys a free Air, it presently breaths, and oftentimes cries; to which Respiration it is not forc'd by the ambient Air, but by the necessity of Respiration, besides which there can be no other cause imagined, that can compel the Infant to breath.

The Opinion of Harvey, *and two Questions.*

XXII. Harvey *believes this necessity of Respiration, is not the cause of Calcitration and delivery; for proof whereof he puts two Questions to be resolved by the Learned.* First, *How the* Embryo *comes to remain in the Womb*

Womb after the seventh Month; whereas being expelled at that time it presently breaths; nay cannot live an hour without Respiration; but remaining in the Womb, it abides alive and healthy beyond the ninth Month without the help of Respiration?

To which I answer what I have hinted before, that according to the *temper of the Woman, her Seed, her Womb, her Dyet*, the heat augments in some Births sooner, in some later, which if they encrease to that bigness in the seventh Month, that refrigeration by Respiration is necessary, then the Birth breaks its prison by Calcitration, and such a Birth, whatever *Harvey* thinks, cannot abide alive and sound till the eighth or ninth Month; for the Birth that abides so long in the VVomb, is not come to that degree of heat in the seventh Month, as to want Refrigeration.

Harvey's *other Question.*

XXIII. Harvey's other Question is, *How it comes to pass, that a new born Child, covered with all its Membranes, and as yet remaining in its water, shall live for some hours without danger of Suffocation; but being stript of its Secundines, if once it has drawn the Air within its Lungs, cannot afterwards live a Moment without it, but presently dies?*

To this Question of two Members I answer, that the first part perhaps may be true of an *immature Birth* thrown forth by *Abortion*, by reason of its small heat requiring little Refrigeration: but of a *Mature Birth*, brought forth in due time, it cannot be true; there being so much heat in it, as must of necessity be cool'd by Respiration; and therefore such a Birth being included within the Membranes, cannot live for some hours, as *Harvey* supposes, nor half an hour, no not a quarter of an hour; And this the Country People know by experience, that a Colt or a Mare, being once brought forth, if it remain included within its Membranes, I will not say an hour, or half an hour, but a very little while, half a quarter of an hour or less, is presently stifled, and therefore they take care that some body stand by, while the Dam has brought forth, to break the Membranes, which if no Body be present, the Dam often does with her Mouth: And which all other Creatures that bring forth living Conceptions generally do, else the Birth is stifled. But grant the Birth may live half an hour within the Membranes, this makes not against us. For the external Air presently refrigerates the Air included in the Membranes; which being so refrigerated, the Birth for some time may enjoy the benefit of the cool Air: but not long, for that the hot Air sent from the Lungs with the vapourous Breath would in a short time fill the the whole Capacity of the Membranes, and so the Birth for want of cooler Air must of necessity be stifled.

That the Birth may live a while without Respiration.

XXIV. *To the latter part of* Harvey's *Question I answer, that so long as no Air is admitted into the Lungs, the Birth may yet live without Respiration, because a small quantity of Blood may be forced out of the Right Ventricle of the Heart, into the thick Lungs; and hence the dilated Blood in the right Ventricle, is not carryed to the left; but through a Channel, by which the Pulmonary Artery is joyned to the* Aorta *in the Birth; it flows into the* Aorta, *into which for some time, as being less hot and spirituous, it may flow without Refrigeration, because it is not therein dilated again.* But when by the Inspiring of the Air, the substance of the Lungs becomes to be dilated, then the Compressions of the Vessels being all taken away, the spirituous Blood in great quantity is forced from the right Ventricle of the Heart, into all the open Vessels of the Lungs, which unless it should be somewhat thickned by the Inspiration of the cold Air, could not flow to the left Ventricle, there to be again dilated, but would stuff up the whole Body of the Lungs, and so the Creature would be stifled. And this is the reason that when the Birth has once breathed, it cannot afterwards live, though never so little a while without Respiration. And therefore that is certainly to be exploded which *Bauschius*, the Writer of the German *Medico-physical Ephemerides*, cites out of *Patterson Hayn*, written to him by *Gerges*, a certain *Hungarian* Shepherd. *In Hungary*, says he, *a Woman near her time, in the year 1669. began to fall in labour, insomuch that the Child had already thrust forth his Head without the Womb. But the Birth having cry'd twice or thrice, was drawn back into the Womb, and there remained a fortnight longer, after which the Woman was duly brought to bed.*

Now how far this idle story is from Truth, a blind Man may see. For when the Birth has once thrust forth its Head without the VVomb, unless either by

the force of the Womb, its own ſtriving, or the hand of the Midwife, the whole Body either come forth or be drawn out, the Orifice of the Privity ſo ſtrengthens it ſelf about the neck of it, that it is preſently killed. But by reaſon of the extraordinary narrowneſs of the Capacity of the Womb, it can never return back to the inner parts, eſpecially after it has ſent forth two or three Cries. This let who will believe, and let *Patterſon Hayn*, and *Gerges* the Shepherd believe it as long as they pleaſe, who have ſuffered ſuch a Fable to be impoſed upon by Tattling Goſſips, and ventured ſo ſlightly to divulge it for a Truth.

An Objection.

XXV. *Laſtly it may be objected againſt our foreſaid Opinion, that it is not probable that the neceſſity of Reſpiration forces the Birth to a ſtronger Calcitration, when the Birth in the Womb breaths ſufficiently, conſidering the Proportion of its heat.* For *Veſlingius*, reſting upon the Authority of *Hippocrates*, writes that the Lungs of the Birth encloſed in the Womb, by a gentle dilation draws ſomething of Air, and for proof of this, he alledges the Infants being often heard to cry in the Womb. Examples of which are produced by *Albertus Magnus*, *Libavius*, *Solin*, *Camerarius*, *Sennertus*, *Bartholin*, and *Deuſingius*. Alſo the Learned *Velthuſius* believes, that in this caſe the Air penetrates to the places where the Infant lies, and that it is attracted by the Infant by Inſpiration. Nay the Honourable *Robert Boyle*, *in Experim. Phyſic. Mathem. Exercit.* 41. ſeems to confirm this crying by a moſt memorable Example. *I knew a certain Lady*, ſays he, *who was with Child ſome years ſince; at what time her friends bemoan'd her Condition to me, that ſhe was very much terrified with the Crying of her little Infant.*

All in an Error, who write of Reſpiration and crying in the Womb.

XXVI. *But whoever they were, they were all in an Errour that wrote of the Reſpiration, and crying of the Birth in the Womb.* For firſt the Relations of theſe things are taken from the vain ſtories of idle and unskilful Women and Men; who either conceive Whimſies of their own; or elſe on ſet purpoſe perſwade others into a belief of theſe Vanities. Either to move the Rich to Pity (for generally the poor are they that only hear theſe Noiſes) or elſe to get themſelves a name among the Vulgar, by eſtabliſhing ſome Prophecy upon theſe feigned wonders. But we ſhall hardly read of any perſon of Reputation, that ever heard this imaginary Crying. *Secondly*, it is impoſſible there ſhould be any breathing or crying in the Womb, without any Air; but which way ſhall it come thither. For the Mouth of the Womb is ſo cloſely ſhut, by the Teſtimony of *Galen* or *Hippocrates*, that it will not admit the point of a Probe, nor the leaſt Air or Water. Of which though ſome make a doubt, yet we found to be true, in the year 1649. When we opened the Body of a young Woman that was poyſoned, in whoſe body we found the Womb ſwollen with a Birth above a hands length; and the Mouth of the Womb not only moſt cloſely contracted, but alſo ſtopped up with a glutinous, clammy, flegmatick Humour, that would not admit the ſharp end of a Bodkin, unleſs it ſhould have been forced through the Glewy ſubſtance. The ſame thing we found in *December* 1665. in a Woman ſeven Months gone that dy'd ſuddainly. Moreover beſides this cloſing up the Mouth of the Womb, the Birth is alſo ſo exactly encloſed in its Membranes, that no liquor contained within can diſtil forth, nor any external Air penetrate withinſide. Which difficulty *Gualter Needham* obſerving after he has related a ſtory as it was told him of a Child that was heard to cry in the Womb of a Noble Woman, *L. de format. fœt*, writes, that the Air cannot come from without to the Birth, but that it may be there generated by the fermentation of the Humours latent within; as wind is bred in the Stomach, Guts and other parts. But this being in ſome meaſure granted, how is it poſſible that the Birth going about to cry, ſhould draw in that or any other Air, when it ſwims upon the Milkie liquor of the *Amnion*, which would fill up the Mouth of it? For ſhould it breath in the Air, it would be choaked, in regard the Liquor in the Mouth would ſlide down into the Lungs, through the rough Artery, together with the Air, and fill up the middle Fiſtulous part of the Windpipe. Certainly tis a wonder that thoſe Learned Men who have written concerning this Uterine Crying, have not made this Obſervation upon it, that the ſound which is heard in the Belly of a Woman with Child, which they that hear perhaps take for the crying of the Infant, proceeds only from the Wind that roars in the Guts, compreſſed and ſtraitned by the bulk and weight

weight of the Infant: as we hear ſometimes a wonderful whiſtling of the wind, impetuouſly forcing it ſelf through the narrow holes of windows, ſuch a one as once I remember I heard my ſelf, with ſeveral others, exactly reſembling the ſighs and groans of a Man in ſorrow, or in ſome great danger; ſo that all that heard it were frighted, and talked of nothing but Spirits and Hobgoblins, that bewayl'd ſome terrible Misfortune that was to befal them; whereas after half an hours ſearch we found the winding hole, through which the wind paſſing, made that lamentable noiſe, which ceaſed upon ſtopping the Hole. And thus tis no wonder if the Vapours paſſing through the ſtreights of the Compreſſed Guts, ſometimes make a whining noiſe like the crying of an Infant, as you ſhall hear in the lower Belly, noiſes of the wind reſembling perfectly the croaking of Frogs, and the Hiſſing of Serpents. Therefore, ſays *Ariſtotle*, the Infant never cries till it be come forth out of the Womb.

The cauſe of Abortion and dead Births.

XXVII. *Here perhaps an important doubt will ariſe, if it be ſo that the Birth promotes its delivery by vehement kicking, occaſioned by the neceſſity of Reſpiration, and ſo provokes nature to Expulſion, what's the Reaſon,* 1. *That ſometimes a very weak Birth, that wants no Reſpiration, is forced out of the Womb in the fifth or ſixth or ſeventh Month, (in which ſeventh Month however many mature Births ſufficiently ſtrong and lively, and wanting Reſpiration are born, though it may happen that many Births unripe, very weak, and unable to brook the change of Air and Nouriſhment, may be and are frequently born in that Month.)* 2. *That a Birth that dies in the VVomb, conſequently requiring no Reſpiration, is caſt forth by female Labour, ſeeing that in neither of theſe caſes, there is any need of ſtrong Calcitration to promote delivery.* I anſwer to the *firſt*, that ſometimes a Birth may be found in the Womb, according to the time that it abides there after Formation, though not ripe, that is ſo weak as not to be able to brook the changes of Air and Nouriſhment; and that of ſuch a Birth a Woman miſcarries by *Abortion*, not through the neceſſity of Reſpiration, or provoked by ſprawling, but by reaſon of a cauſe far different, either the flowing in of too much flegm, or too violent Agitation of the Womans Body, or through the rapid, diſorderly and violent motion of Spirits and Humours, as in the paſſions of Anger or Fear, by all which cauſe the *Placenta* is looſned from the VVomb, or the Birth is killed; which then becomes heavy and troubleſom to the VVomb, and provokes it to Expulſion, and to the end that trouble may be expelled, preſently the Spirits are ſent in great quantity to the *Contracting Fibers* of the VVomb and *Muſcles* of the *Abdomen*, which by drawing both the one and the other together expel the Birth.

To the *Second* I ſay, that the Birth being dead, for ſome times the pains of Travel ceaſe, becauſe the kicking and motion of the Birth ceaſes: neither does the VVoman come to be in travail again, unleſs her pains are mov'd by Medicines that procure a ſtrong Fermentation in the Humours: Or by the Putrefaction of the Birth, or the Diſſolution of the *Placenta*, or that the ſharp Humours bred by the retention of the *Secundines* ſharply boyl among themſelves, or that the weight and corruption of the dead Infant, give ſome particular trouble to the VVomb, and ſo by the means of a more copious flowing in of the Animal Spirits, excite it to new ſtriving, and a more violent Expulſion.

Of delivery that happens after the Death of VVomen with Child, or dying in Labour, enough has been ſaid, C. 25.

The End of the Firſt Book.

THE SECOND BOOK OF ANATOMY.

TREATING *Of the Middle* BELLY *or* BREAST.

CHAP. I.

Of the Breast in General.

WE come now to the Middle Belly, the *Chambers* or *Throne* of the Royal Bowel, to which the concocted and refin'd Nourishments are offered as junkets, to make out of them with its princely Blast a wholesom Nectar for the whole Microcosmical Commonwealth, and distribute it to all the parts through the little Rivulets of the Arteries.

The Breast. I. *The Middle Belly is vulgarly called* Thorax ἀπὸ τῦ θορέω, *to leap; because it contain the leaping Heart: and it is that Concavity, which is circumscribed above with the Clavicles; before, which is placed the* Sternon *or Breast-Bone; behind, with the Bones of the Back;* the fore parts of which are called the *Sternum* and Breast; the hinder parts the Back.

The structure of it. II. *The structure of it is partly Bony, partly Fleshy; It ought to be partly Bony, to the end the Breast may remain expanded; lest there should be a falling by Reason of the softness of the Fleshy parts, and so the most noble Bowel, the Heart, together with the Lungs, should be compressed and hindered in their Motion. It ought to be partly Fleshy, that it may be conveniently mov'd in Respiration, which the Heart can by no means want.* And for the preservation of that Expansion, and the more convenient liberty of Motion together, it was requisite that it should be composed of several Bones; and that those should be joynted together with Gristles, and that there should be Muscles not only between each, but that they should be covered over with many.

The Figure. III. *The shape of the Breast is almost round, somewhat depressed before and behind, and extended to a convenient length.*

The largeness of it. IV. *The largeness of it is different according to the bulk and size of the Persons and difference of Sex, as being of less extent in Women, especially Virgins than in Men; for that Men having a hotter Heart and Blood, and more laboriously employed require a greater Respiration, and dilatation of the Lungs, that the hot Blood flowing into the Lungs, into the right Ventricle of the Heart, may be the sooner refrigerated therein.* But the narrowness

ness of the Breast is never well liked, for when the Lungs in Respiration have not sufficient Liberty to move in the hollow of the Breast, they often hit more vehemently against the adjoyning Ribbs, and thence, because they are very soft parts of themselves, they become languid and feeble, and the Vessels being broken by that same bruising one against another, occasion spitting of Blood, and the corrupted Blood setling in the spungy Caverns breeds an Ulcer, whose companion is generally an Ulcer with a lingring Feaver. For this reason great care is to be taken of Infants, not to swathe their Breasts too close, which prevents the growth of the Ribbs, and the Dilatation of the Breast. Sometimes it happens in young People, that Nature being strong of it self, dilates the narrow hollowness of the Breast, by bowing and removing some Ribs out of their natural Place, and causing a Gibbosity, makes more room for the motion and Respiration of the Lungs. But to avoid that deformity, there are some Artists that by the help of some convenient Instruments, do by degrees compress those Gibbosities that they appear no more, which is a Cure frequent among us. But then I have observed that those Bunch-back People being so cured, by reason of the Breasts, being reduced to its former streightness, become *Asthmatick*, and in a short time spit Blood, and so fall into an incurable Consumption. And there we advise the hunch-back'd never to seek for Cure, Life being more desirable with the deformity, than Death with the Cure.

Its Division. V. *This middle Venter consists of parts containing, and parts contained.*

Containing parts. VI. *The containing are either common or proper. As for the Common*, See l. 1. c. 3, & 4.

The proper. VII. *The proper containing are the Muscles of the Breast, describ'd* l. 5. several Bones, the *Sternum*, the Shoulder-Blades, the *Clavicles*, all described *l.* 9. The Breasts, the *Diaphragma*, the *Pleura*, or Membrane that encloses the Breasts and Entrails, the *Mediastinum*, or doubling of the Membrane of the sides.

The contained parts. VIII. *The Parts contained are the Heart, with its* Pericardium, *the Lungs, with a Portion of the* Trachea, *or rough Artery, the Greater part of the Gullet, a Portion of the Trunks of the* Aorta *Artery, and the hollow Vein, the* Thymus, *or Glandule in the Throat, with several other smaller Vessels.*

Moreover the Neck, because it is an Appendix to this Belly, is usually number'd among the parts of this Belly.

CHAP. II.

Of the Breasts, and the Milk.

Their place. I. *The two Breasts, as well in Men as in Women, are spread upon the middle of the* Thorax, *of each side one, above the Pectoral Muscle drawing the Shoulder, and cover it, by that means perfecting the handsom shape of the Body.*

The names. II. *These by one general name the Greeks call* στῆθος, *those of Women by a particular name* μαστὸς: *By the Latins they are called* Mammillæ, *and* Ubera, *though some will have* Mammæ *to be proper to Women*; Mammillæ *to Men*; *and* Ubera *to Beasts.*

The bigness. III. *They are but small in Men*; *but of a larger size in Women, for the Convenience of giving Suck. But among Women likewise there is a difference in the Bigness*; *because that before the flowing of the monthly Courses, and in old Women they swell out very little or nothing.* But in middle ag'd Women, they are lesser or bigger according as the Women breed or give suck; or as they are such that neither breed nor give suck: for that the one require larger Breasts than the other.

In several Parts of *India*, as in the Kingdom of *Senega*, the Women are reported to have such large Breasts, that they reach down to their Bellies, and being raised up, they can fling them over their Shoulders. Here at *Utrecht* we formerly saw a Nurse that had such large Breasts, that she could suck her self; and if the Child lay upon her Shoulders, she could conveniently give it the Nipple. Monstrous were those Breasts mentioned by *Bartholine* in his *Hist. Anat.* in these words: *A Woman*, says he, *of note in* Helsingore *carryed about her, Breasts so large and ponderous, that they hung down to her Knees: and when she sat, she rested her weighty Burthen upon her Knees.*

A consideration of the bigness. IV. *Now the bigness of the Breasts is chiefly to be considered by the Physician, when he comes to the choice of a*

a Nurse. For this reason Moschius, *an Ancient Physician writes, That a* Nurse with moderate Breasts is always to be chosen, for that great Breasts do not breed Plenty of Milk, and too small denote frigidity. *But though it may be so generally, yet experience tells us, 'tis no certain Rule.* For we have known many Women that had very small Breasts; yet every time they were with Child, their Breasts swell'd to a moderate Bigness, and so continued all the time they gave suck, yielding great store of Milk; but after the Child was weaned fell again. Others again we have seen, and those not a few, that having large Breasts, bred a great deal of Milk; and it is the common Opinion, that great Beasts breed more Milk than small ones. This in Cows the Country People pretend to know by Experience, who will therefore give more for a Cow that has a large Udder, than a small one.

Their number. V. *They were formed two in number, partly that there might be sufficient Nourishment, for a double off-spring, partly that, if one should prove defective through any distemper or any other accident, the other might supply the want.*

Their Situation. VI. *They are seated in the middle of the Breast, not in the* Abdomen *as in Brutes, for the Convenience of giving Suck, that they might be ready for the Infant in the Arms of the Mother.* The *Rabbins*, by the Report of *Buxtorf*, feign other idle Reasons for their Situation where they are; Thus *Rabbi Abba*, that the upper Region of the Breast was ordained for the Breasts, that the Child might be discreet and prudent, and suck understanding from the Heart of the Mother. *Rabbi Jehuda* alledges it to be done, lest the Child should see the privities of the Mother; and *R. Mathana*, that he might not suck in a nasty Place.

The shape and colour. VII. *The shape is Hemispherical, the substance soft and white in Women; in Cows and other Creatures not so white, and sometimes enclining to yellow.* *Riolanus* notes, that the substance is ruddy under the Armpits in Women with Child, and such as give suck, which we could never observe.

Glandules. VIII. *They are composed of many Glandulous Bodies different in bigness, little Pipes and Chanels meeting together, joyn'd and compacted with a good quantity of fatt spread over them, which are also swath'd about with a fleshy Membrane, and knit with Muscles underneath.* *Riolan* and *Wharton*, contrary to ocular Testimony, deny this multitude of Glandules, and aver that the whole Breast is composed of one sole Glandulous Body, divided into no distinct Globes; yet in the mean while they grant that in Breasts that are not sound, little Globes may be discerned; which certainly would not be perceived in Breasts unsound, unless they were really in sound Breasts, which are less tumid.

A large Glandule. IX. *There is one large Glandule seated in the middle, which the rest that are lesser surround: also infinite Folds of milky Vessels are scattered among the Glandules, by means of which the Milky juice is not only conveighed to all the said Glandules, but also the lesser pour forth their Milk into the great Glandule.* Moreover there are larger and copious Pores in the Glandules themselves, in which as in so many Cells the Milk is reserved till the time of giving Suck, unless it be so thin and so plentiful, as to flow out of it self.

The Teat. X. *Over the great Glandule lies the* Teat, *which is a little, round spungy Body, cloathed with a thin Skin, and penetrable with many little Holes.*

Where the Milky Chanels terminate. XI. *In this the Milky Channels of the Glandules terminate; and thorough the little holes of it, as through a little pipe the Milk is poured by sucking into the Mouth of the Infant.*

The exquisite sense of the Teat. XII. *It is endued with an Exquisite sense of feeling; and the gentle handling of it is delightful, but a Boysterous rubbing of it painful;* and besides by handling and sucking it falls and rises, like the nut of the Yard.

Its Colour. XIII. *The colour of it is red in Virgins, more livid in those that give suck; but in Women that are past Child-bearing it grows black.*

Its bigness. XIV. *The bigness of it is various: in some as big as a Mulberry, in most no bigger than a sweet Bryar berry; in others lesser: but more prominent at the time of giving suck, than at other times.*

XV. *The*

The Areola. XV. *The Circle that surrounds it is called* Areola, *pale in Virgins, in pregnant Women brown, in old Women black.*

Vessels. Nerves. XVI. *The Breasts have five sorts of Vessels:* 1. Nerves, *from the upper Intercostals, which being carryed to the Teat in great number, occasion its quick sence of feeling.* 2. Arteries *for Nourishment, the innermost, from the* Subclavial *Branch of the great Artery; the outermost from the* Axillarie *Branch.* 3. Veins, *to bring back the Blood remaining after Nourishment; far bigger and more numerous than the Arteries; and those double, running out from the exterior and interior parts of the Breasts to the* Subclavials *and* Axillary *Branch of the* Vena Cava, *and discharging themselves into it.* Through these, in Nurses, sometimes a copious quantity of Milky matter is carryed from the Breasts to the *Subclavial Veins*, in like manner as the Chylus through the Chylifer Pectoral Channel, and for that reason chiefly these Veins are so large and numerous, because it is their business to conveigh the Blood remaining after Nourishment, but also part of the milky Liquor redundant in Women giving suck, to the *Subclavial Veins*, which liquor also remaining after the Child is wean'd, is not corrupted in the Breasts, but is carry'd thither through these Veins. 4. *Milky Vessels.* 5. *Lymphatick Channels.*

Arteries. *Veins.* *Lacteals. Lymphaticks.*

One of the innermost Arteries and Veins descending from the *Subclavials* (which are called *Mammarie*) creeps on both sides toward the lower parts under the straight Muscles of the *Abdomen*: which are met by as many Arteries and Veins from the lower Belly, coming from the *Epigastrics*; which are said to close by *Anastomoses* with the former, under the middle of the said Muscles, by means of which, as it was formerly believed, there is a great Correspondence between the *Womb* and the *Breasts*, as also that the Blood is carryed from the *Womb* toward the *Breasts* to be turned into Milk. But the meeting of these Vessels is meerly fictitious, for we never could find it our selves, neither could any body else ever shew us any such thing. Sometimes indeed their ends approach nearer one to another, but they never unite. Besides that the Circulation of the Blood has long since refuted that Opinion. See more concerning this. *L.* 1. *c.* 5. *& L.* 6. *c.* 3.

XVII. *That there are* Lymphatick *Vessels in the Breasts, there is no reason for any one to question; but whether so numerous as* Wharton *says he has observed them may be doubted.* Probable it is, because the *Milky Vessels* contain a very watery *Milky* Liquor, that he thereby deceived took many *Milky Vessels* for Lymphaticks, which made him describe a great number of those Vessels. But those *Milky Vessels* are filled with a watery juice, when the Woman giving suck being a hungry, has taken much watery Nourishment, and then the Milk that is suckt out of the Breasts proves very watery. Lymphatick *Vessels.*

XVIII. *The* Milky Vessels, *quite different from the Veins and Arteries are for the most part observed to be intermixed with the Glandules of the Breasts, springing from the whole Circumference of the lower part, and closing together in the middle of the Breasts; which Communion and Continuity nevertheless with the Chylifer Channels absconding within the Trunk of the Body, could never be made manifest hitherto by all the diligent enquiry of Anatomists.* Because that in dead Bodies though but newly hang'd, these Accesses or small Channels of Communion lye hid in like manner as the Passages of the Stones into the *Parastates*, and out of the *Seminary* Vessels into the *Urethra*, and such like Passages, through which we find that Nature orders several Translations of humours in living Bodies. However there is no question to be made, but that in the inner parts, they pass no less through the Membranes and Muscles to the Breasts, than through the Arteries and Veins. And therefore they are not conspicuous, but lye hid, because the Chylous juice abides not within 'em, no more than Urine in the Ureters, but by the Compression of the Muscles of Respiration, and the parts through which they pass, is presently and swiftly thrust forward and passes through them. In like manner as the *Milky Vessels* of the Mesentery, the *Chylus* being empty'd into the Receptacle, swiftly vanish, and are no more seen, before new *Chylus* causes 'em to swell again, which because it stays not long within them, affords but a short view of them. Nor is it to be wondered at, that these small Milky Channels, being extended toward the Breast, should escape *The Milky Vessels.*

escape the Eye, when the Pectoral Chyle-bearing Channel it self, running out indifferent large all the length of the Spine, could neither be seen nor found by the most curious and quick-sighted *Anatomists* of so many Ages, which nevertheless in our time, rather chance, than Art or Diligence discovered. Perhaps some such accident may bring to light these Chyle-bearing Channels of the Breasts. For that they are there, Reason, Use, and the effects sufficiently demonstrate, and *Hippocrates* describes them under the name of little Veins, when he says, *That in Women after Delivery, the little Veins of the Breast become larger, to draw the fat Chylus from the Belly, from whence the Milk is bred.* However there is no question to be made, but that they are there, though the Ocular Testimony of some accurate *Anatomists* may be wanting for Proof. Yet *Antonie Everard* observes to us that he remarked a manifest deduction of the *Milky Vessels* to the *Breasts*: for says he, *some of these Channels arising from the descending Trunk, running out above the Muscles of the* Abdomen, *under the Fat, afforded matter for the Milk to the Glandulous substance of the Breasts, which afterwards form'd little Pipes sufficiently conspicuous, out of which the Milk is carryed into the Common Channel, and suckt through the Nipple.* Thus also *Pecquet* at *Monpelier* in the year 1654. before the most experienced *Riverius*, found out and demonstrated in a Bitch that gave suck, near the third upper Rib, a Milky Channel reaching to the Breasts, out of which a great quantity of Milk was pour'd forth. Which Experiment he often prov'd in Bitches that gave suck by the like Effusion, always of great store of Milk out of the Vessels being opened, as often as he began his dissection from the outward parts near the first Ribs of the Breast. He had also before observed this little Branch to proceed from the forked Separations, which however was not inserted into the *Subclavial* Channel, but turned away as it were by stealth toward the Armhole, between the Muscles of the Breast. Nor was it a lesser small Branch, which *Theodore Schenkius* observed running with a direct course without the *Abdomen*, to the Teats in a dissected Bitch that gave suck, which being squeezed pour'd forth its juice into the Nipple. *Ludovicus de Bills* describes in his *Belgic Apology*, certain little Vessels descending from the Lymphatick Circle situated in the Neck toward the Glandules of the Breasts, which he thinks to be Milky Vessels but erroneously, not distinguishing between the Lymphatick and Milky. So that contrary to reason, the ocular Testimony of the said Persons ascertains us of the Production of Milkie Vessels to the Breasts.

As *Antony Everard* found out in Coneys little Pipes, extended from the Descending Trunk to the Breasts, which in those Creatures seem to be seated in a lower place; so in a Woman certain little Branches seem rather to be extended from the ascending Pectoral Trunk, to the Breasts seated in the Breast it self. This appeared in our Secretaries Wife four or five weeks gone, who happening into our practice while I was more accurately studying this point, was complaining that she had very little Milk in her Breasts, and that if the Infant suckt any thing hard, she felt a pain very troublesom from her Breasts to her Back, about the middle Region between the Shoulder-blades, but somewhat lower; and that she had some slight sence of the same pain as far as her Loyns; but when the Child did not suck, she felt no pain at all. Without doubt these were some Impediments, by reason of which the Milky Vessels had not free passage to the Breasts, and hence the Child drawing in their upper part, and no sufficient *Chylus* following out of the Pectoral Channel, that sucking occasioned some pain from the Breast to the Milky Pectoral Channel: as is more especially apparent from hence, that though this Woman were in pain upon the drawing of the Infant, yet she felt but very little Milk in her Breasts, and so was forced to provide another Nurse for the Infant. The same I observed in the Wife of a Collegue of mine, who being brought to bed in *September* 1664. complained that she could not endure the drawing of the Infant, by reason of the pain she felt at that time, extending it self to her back between the Shoulder-blades, and thence to the Loyns. Afterwards I observed several Examples of the same Nature. All which things make it probable that the Milky Mammarie Channels are derived from the Milky Pectoral Channel.

XIX. *From what has been said it is apparent how much they are in the wrong, who affirm that the* Chylus *is carryed with the Blood through the Arteries to the Breasts, and out of them separated again from the Blood and changed into Milk.* As *Thomas* Con-

Whether the Chylus *be carryed through the Arteries to the Breasts.*

Conſentinus, with whom *Gualter Needham* agrees, aſſerts, that the Milk is ſeparated from the Blood, which is carry'd through the Pectoral and Mammary Arteries: Which he endeavours to prove, 1. By the manifold Ramifications of the Arteries, which are obſerved in the Glandules of the Breaſts. 2. By the *Anaſtomoſes* of the *Epigaſtrick* Veſſels, with the *Mammary* Veſſels. 3. By the extraordinary bigneſs of the *Mammary* Arteries conſpicuous in Women that give Suck. But theſe Arguments are not ſo ſinewy, as to ſuſtain a new Opinion of ſo much weight; for that much more copious Ramifications of Arteries are conſpicuous in the Brain and its Membranes, in the Lungs, and ſeveral other parts, and yet they ſhew no ſign at all that I know, of any Milky or Chylous matter contained in the Arterious Blood. In like manner the *Anaſtomoſes* of the *Epigaſtrick* Veſſels with the *Mammary*, teach us nothing certain concerning this matter, which have been ſaid to have been found by many; but were never by any yet demonſtrated. As for the bigneſs of the Arteries, that does not proceed, as he ſuppoſes, from the plenty of *Milk matter*, but becauſe the Glandules ſwelling with Milk, ſomewhat compaſs the ends of the Arteries, ſo that the Blood flowing into them, cannot flow out again ſo freely and ſwiftly, as when a Woman does not give ſuck; and therefore being detained with them in great abundance, cauſes 'em to appear more turgid and ſwollen than at other times. But I wonder *Conſentine* makes no mention of the Veins, which in Women that give Suck, are much more numerous and bigger than the Arteries. Several other Arguments of leſſer note are urged by *Conſentine*, but becauſe they are diffuſed in the following diſcourſes here and there, I ſay no more of them at preſent. And thus this new Opinion falls to the Ground; That beſides the Blood the Chylus alſo, being actually ſuch, is carryed and circulated through the Veins and Arteries, and afterwards ſeparated again from it.

The Office. XX. *The Primary Office of the Breaſt is to make Milk; the ſecundary Office is to cover the Breaſt, and preſerve it from the External Cold; and in Women to contribute toward the Beauty of their Structure.*

Firſt digreſſion. Milk, what. XXI. *Now the Milk is a white and ſweet Juice, prepared in the Breaſts for the Nouriſhment of the Infant.*

The matter of Milk. XXII. *As to the matter of the Milk, there are great diſputes among the Learned. For ſeeing that the ſpirituous Blood is carryed through the Arteries, and the Chylus through the Child-bearing Veſſels to the Breaſts; and for that they are conſpicuouſly full of Veins, a Queſtion ariſes, Whether the Milk be bred out of the Arterious or Veiny Blood, or Menſtruums; or out of the beſt or leſs pure Alementary Blood, or out of the Chylus.*

Whether out of Menſtruous Blood. XXIII. Ariſtotle *and* Galen *affirm that the matter of Milk is the Blood that uſed to be evacuated at the monthly Purgations. Which Opinion they ſeem to have taken from an Aphoriſm of* Hippocrates, If a Woman that is neither with Child, nor has brought forth have any Milk, her Flowers are ſtopp'd. *And theſe are followed by all the Ancient and Modern Phyſicians and Philoſophers, inforced with theſe Arguments.*

1. That upon the ſtopping of the Flowers, the Milk breeds not only in Women with Child, and delivered, but alſo in Virgins. Of which ſort of Virgins breeding Milk, *Vega*, *Gorrheus*, *Schenkius*, and others produce various Examples.

2. Becauſe Women that give ſuck, never have their Flowers; or if they flow in great quantity, the Milk decreaſes or dries up altogether.

3. Becauſe they whoſe Flowers ceaſe through Age, never have any Milk in their Breaſts.

Abſurdities from the former Opinions. XXIV. *But from this Opinion ſupported by ſo many Arguments and Authorities, theſe five Abſurdities follow,*

1. *That when Milk is bred, the Flowers muſt of neceſſity ſtop.* But quite the contrary, we have a thouſand times ſeen Nurſes and Mothers, that have had their Flowers in great quantity at fixed times, without any decreaſe of their wonted plenty of Milk, which all Phiſicians in their Practice will teſtifie as well as my ſelf. But the reaſon why the Courſes ſtop in Women that give ſuck, is not, becauſe Milk is generated out of them, but becauſe a great quantity of Chylus daily flows to the Breaſts, and more ſparingly to the Heart of the Wo-

man that gives ſuck, whence it happens that there is Blood enough generated for the nouriſhment of the Body; but no redundancy that requires monthly Evacuation.

2. *That then the Milk would moſt abound, when there is moſt plenty of Menſtruous Blood that ſtops; leaſt, when but little.* And yet in the firſt Month, when that Blood moſt redounds in Women, and is leaſt waſted by the *Embryo*, then is there no Milk bred: But in the laſt Months of a Womans time, when the grown Birth chiefly conſumes the ſuperfluous Blood, and there is leaſt redundancy of it, then the Milk breeds in the Breaſt. Moreover in Childbed-Women when the Menſtruums flow plentifully, there is yet great ſtore of Milk in their Breaſts; and that increaſing nevertheleſs the Menſtrua do not ſtop.

3. *That there ſhould be ſo much Milk generated, as there is Redundancy of the ſaid Blood.* And yet there is no Man but eaſily obſerves the inequality of that proportion of a ſmall quantity of Blood, that redounds every Month, and of the great quantity of Milk drawn from a Woman every day. And then again what ſhall we ſay of Sheep, Cows, Goats, and ſuch like Animals, that never have any Menſtruous Blood, and yet every day yield great quantities of Milk.

4. *That Milk ſhould only breed in Ripe Women, that either have or may have their Flowers.* But new-born Infants not only Female but Male, evince the contrary. Out of whoſe Breaſts we have ſeen Milk to flow for ſome days, nay, for ſome weeks together, or elſe eaſily ſqueezed out with a ſlight compreſſion of the Finger. And the ſame thing *Cardan* obſerved, and *Schenkius* reports to have been ſeen by *Camerarius*; and indeed any body that will, may obſerve it in new-born Infants. Dry old Women alſo are an Argument to the contrary, whoſe courſes generally ſtop by reaſon of their Age, of whom nevertheleſs the writers of Phyſical Obſervations, beſides *Ariſtotle*, relate that ſeveral have had great ſtore of Milk. *Boden* alſo, *Henry ab Heers*, and others give ſeveral examples of the ſame thing.

5. *That Milk never breeds in Men, becauſe they have no redundancy of menſtruous Blood.* But yet *Ariſtotle* and *Avicen* teſtifie the contrary. Who both teach us that Men many times give a great quantity of Milk. They that have travelled the new World, report that they have found ſome Countries there, where the Men had the greateſt ſtore of Milk, and gave the Children ſuck. Which Teſtimonies of theſe Experiments *Veſalius*, *Eugubius*, *Alexander Benedict*, *Bartholine*, *Stantorellus*, *Cardan*, *Gemma* and ſeveral others confirm by Examples. Nor will that diſtinction here avail, which *Bauhinus*, *Spigelius*, and *Ludovicus Mercatus* alledge, that the ſame Mens Milk is no true Milk, but a juice like to Milk, and therefore to be diſtinguiſhed from Milk. For it is not probable that ſo many Eye-witneſſes, all prudent Men, that underſtood what they did, could be ſo deceived, as not underſtand when they taſted Milk. Beſides that, it is bred in the Breaſts, and differs nothing at all from Womens Milk, neither in colour, ſmell, taſte or ſubſtance, and the Children are as well nouriſhed with it, as with Womens Milk, as the Hiſtories teſtifie.

Whether out of Alimentary Blood.

XXV. *Others to avoid all the aforeſaid difficulties, alledge that it is not neceſſarily bred out of the Menſtruous Blood, but out of ſome redundancy of the Alimentary Blood. But theſe Men while they endeavour to ſhun* Carybdis *fall into* Scylla. *For ſeveral Arguments altogether deſtroy this Opinion.*

1. It is impoſſible that a Woman that gives ſuck, ſhould live with ſo much loſs of Blood: For take but from any Man for a few days together, a pint or half a pint of Blood, it cannot be done without an extraordinary Emaciation of the Body, deſtruction of the ſtrength, and vigour of the Body, and hazard of Life: Or if an exceſs happen in the flowing of Courſes, it overweakens the Party to a high degree. Now is it probable that a Woman ſhould yield ſo many pints of Milk bred out of the Blood every day, for whole Months and years together, without any emaciation or decay of Strength or Health. If you anſwer that they are ſometimes ſo weakned, that they are forced to wean the Child. I anſwer that does not happen by reaſon of the great quantity of Blood changed into Milk, but becauſe the Chylus is carryed in too great quantity to the Breaſts, and there is changed into Milk, while the leſſer Portion is carryed to the Heart, and paſſes into Blood, the conſequence of which defect muſt neceſſarily be Emaciation and weakneſs of the Body.

2. If the Seed which is generated out of

of the Blood being evacuated in a moderate quantity, debilitates the whole Body, shall not the Milk much more enervate the natural strength, being daily drawn out in great quantity? But this is not done.

3. If after any great and often iterated Evacuation of the Blood, decay of strength, *Cachexy*, Dropsie, and other cold Distempers follow, shall Women that give suck, with whom this continual Evacuation of Milk lasts for whole years together, be free from those Distempers, and enjoy a more sane habit of Body?

4. If every suddain alteration be dangerous, why, when Women wean their Children, at what time plenty of Milk fails of a suddain, and by consequence also, the evacuation of Blood ceases, why I say do they not fall into some pernicious *Plethora*? Which however never happens. You will say perhaps that some, Women eat less at that time. I answer that they are not without an Appetite for all that, nay, and that most Women eat as well, and as much after weaning as before. If you say, that same superfluous Blood is evacuated at the monthly Periods, that evacuation is too thin and rare, in respect of the whole Quantity of Blood changed into Milk, which before was wasted every day.

5. If the Blood, that flows into the parts in greater quantity through the Arteries, and distending the parts, causes stronger Pulses therein, why does not that happen in the swelling Milk-bearing Vessels of Women; wherein nevertheless there is no stronger Pulsation perceived.

6. If the Blood flowing plentifully to the Breasts, should be extravasated therein, and tarry till changed into Milk, it would not be changed into Milk, but into Matter, and breed an Apostеme; as happens in Impostumations of the Breast.

7. By the Laws of nature, there is no return from Privation to Habit. Shall the *Chylus* alone be excepted from this general Rule? and lose its whiteness, and all its other qualities, so to pass into Blood, afterwards to quit again the qualities of Blood, and reassume its former qualities of Blood? Whether the Blood now concocted for the nourishment of the solid Part, shall lose its more perfect condition, and be changed into a Milky substance, to be again concocted into Blood by the Birth? Nature does nothing in vain, neither does she tread the same path backward and forward in any of her Operations: Neither does the motion of Concoction run retrograde to Crudity, but only advances to the greater perfection. Can a Ripe fruit grow green again, to be ripen'd again? So the Blood made out of the Chylus, cannot run retrograde into a Milky Chyle, to be concocted again into Blood. Some one will say perhaps with *Plato*, That nature uses here deceit, to alienate Man from feeding upon Blood, otherwise that Milk differs nothing from Blood, but in Colour. But what need any such Artifice to delude new-born Infants, who while they suck, never see what colour the Milk is on: Or if they did, were not able to distinguish one from the other. Why is not the same abuse put upon Lyons, Wolves, Tygers and Leopards, to whom cruelty is natural? Neither let any Man object that while the Seed is generated, the Blood in the same manner passes into a substance, again to be changed. For then it is not changed into a Chylous, or any other Cruder or worser Substance, to be again reduced into Blood, but into a far better, out of which not only some parts must be nourished, but the solid parts of the Birth are to be generated and formed.

8. Seeing that the nourishment swallowed, requires several hours time to change it into Blood, how comes it to pass that Nurses presently after they have eat and drunk, presently after feel a copious quantity of Liquor flow to the Breasts, before any Blood could be generated out of the said Nourishment? What is the reason that the Milk attracts to its self immediately, and retains the faculty, quality and odour of what the Nurse swallows, whereas no such thing can be perceived in the Blood, nor in the parts nourished with the Blood; thus if you give a purge to the Nurse, the Physick sooner purges the Infant than the Nurse. Perhaps indeed by long Use and Time, and the many times repeated eating, concoction and preparation of the same thing, some such alteration or quality may be imprinted in the Blood, and the solid parts nourished by it; as in that beautiful Damosel fed with Poyson, that was offered to *Alexander*, whose Body by long use and feeding upon Poysons, became so venemous, that she infected and killed all that lay with her. Now that Milk easily imbibes the qualities of the meat which the Nurse swallows, *Walter Charleton*

proves admirably well; *For*, says he, *Beyond all others, is that Experiment for the demonstration of the Milky Ways; For let the Nurse drink Milk but slightly tinctur'd with Saffron, and within half an Hour after, more or less, the Milk that is milk'd out of her Breasts, shall have the Smell, Taste and Colour of Saffron.*

He also reports an Observation out of *Prosperus Marinus*, concerning a *Roman* Woman, out of whose Nipple the Surgeon drew a little Branch of *Succory*, which she had eaten the day before, and so proves that not only the *Chylus*, but thicker Substances may sometimes also pass together with the *Chyle* to the Breasts. Thus *Aristotle* reports that sometimes swallow'd hairs come to the Breasts and Nipples, an Example of which *Alsaharavius* reports that he saw in a certain Woman.

9. If a Woman go long without Meat or Drink till she be very hungry and dry, Milk will not breed in her Breasts, tho' there be no want of Blood in the Vessels. Which tho' *Bartholine* denies, from the Observation of *Hogheland*: Yet I have often seen it to be true with my own Eyes. And if at that time the Infant suck, it shall not draw any Milk, for want of *Chyle* in the Milky Vessels, but Blood from the Ends of the little Arteries and Veins, open'd at that time more then usually, by the vehement drawing of the Child, till the Woman eats and drinks again, and new *Chyle* come to the Stomach. Of which we have a manifest Example in a Lady of this Town, who in the Year 1650 gave Suck, but not being able to eat or drink for three or four Days together, by reason that her Husband lay dangerously ill, she not only had no Milk in her Breasts, but upon the strong drawing of the Infant, it was found that pure Blood follow'd out of her Nipples. Afterwards when her Husband recover'd, and that her Grief abating, she began to eat and drink well, and good *Chylus* came again into her Stomach, she had immediately plenty of Milk in her Breasts. A certain Sign that that Milk was not generated out of the Blood; out of which however otherwise it might have been made before, when there was *Chylus*; which nevertheless was at that time suckt out of the Breasts pure and ruddy, and not chang'd into Milk.

An Objection.

XXVI. To these Arguments it may be perhaps Objected, That a Cow for the first days after it has Calv'd, sends forth a Bloody Milk; which is a Sign that Milk is generated out of the Blood. I answer, That at first, presently after the Birth, the Milky Pores of the Breasts are not yet so dilated that *Chylus* sufficient may be able to flow through them to the Dugs, and then the little Veins of the *Udders* are open'd by the drawing of the new Calv'd Creature, and a small quantity of Blood flowing out of those Veins, dyes the Milk of a Ruddy Colour; but when the Milky Pores are sufficiently open'd and dilated, and that the *Chyle* flows freely to the Dugs, there is no farther Violence done to the said Veins by drawing, and then that Mixture of Blood ceases, and the Milk breeds in great quantity.

Why the Veins swell in the Breast.

XXVII. *There seems one Difficulty more remaining, How it comes to pass, if the Milk be not made out of the Blood, that in Creatures which give Suck, the Arteries, but especially the Veins, are much larger and more swollen in the Breasts, than in those Creatures that do not give Suck.* But to this we have answer'd already in the Question, *Whether the* Chylus *be carry'd to the Breasts by the Arteries*; and where *the Vessels of the Breast are enumerated?*

Whether made of crude Blood

XXVIII. Conringius, *to avoid these Rocks without Shipwrack, affirms the Milk to be made of the more imperfect and crude Blood, which is not yet concocted to perfect Redness; nor very Spirituous; or much Circulated through the Heart, by the evacuation of which, the Natural Strength is not much injur'd; which, by reason of its Serosity, easily slips to the Teats, and is quickly augmented by Drink. But there are five Difficulties to be Objected against this.*

1. That the *Chylus* assoon as it is dilated in the Heart, presently acquires perfect Redness; so that the Blood which is bred therein, may be said at first to be less Spirituous indeed, but not less red, than other Blood that has oftner circulated through the Heart; Of which, more, *c.* 12.

2. That the cruder part of the Blood, by reason it is more thick, cannot be carry'd so swiftly through the Vessels, and be separated from the more refin'd Blood, and flow to the Breasts alone, not being able to move it self apart, and separating it self from the rest of the Mass.

3. That

3. That in Nurſes that feed upon wholeſome Diet, the Milk is not very ſerous, but fat and thick; whereas otherwiſe by reaſon of its Crudity, it would be always ſerous.

4. That upon ſuck the more ſpirituous and thinner parts would more eaſily follow, than the crude and thicker; and hence would ariſe a ſwift decay of the Strength.

5. That our Bodies are not truly nouriſh'd with ſerous and thin Blood, as is apparent in a Flegmatic *Cachexy* and *Anaſarca*, but with fat and well concocted Nouriſhment, ſuch as Milk is, as is apparent from hence, for that Children ſo long as they ſuck, and are nouriſh'd with Milk-Diet, are better nouriſh'd, and grow more than after they are wean'd: and for that Milk alſo greatly nouriſhes grown People, upon whom otherwiſe ſerous and crude Nouriſhment brings a *Cachexy*, or elſe they are evacuated for the moſt part by Urine and Sweat; nor do they contribute much to the ſtrength of the Body.

All which things inſtruct us, That no Blood, whether Menſtruous, Alimentary, or Crude, can be the Matter of Milk. And therefore this Doctrine inculcated for ſo many Ages, is to be rejected, and we are to ſeek another Matter for its Generation.

Whether out of the Arterious &Nervous Blood.

XXIX. *This Matter*, Wharton *and* Charleton, *the better to find out and deſcribe, divide into two Parts, one Chylous, the other Spermatic; and this they ſay is much leſs in quantity than the other. The one they ſay is tranſmitted to the Dugs through the Arteries of the Breaſt; but that this is carry'd thither through the Nerves. But here they are under a double Miſtake.* Firſt, Becauſe they do not conſider that there is no *Chyle* nor *Chylous* Humor contain'd in the Arteries; becauſe the *Chylus*, when it paſſes the Heart, there loſes its own Form, and takes the Form of Blood, and never returns to *Chylus* again. Secondly, Becauſe they think that the Viſible and thick Alimentary Humors paſs through the Inviſible Pores of the Nerves: which we have at large refuted, *l.* 1. *c.* 16. and *l.* 8. *c.* 1.

Whether out of the Serum.

XXX. Hieronymus Barbatus *deſcribes a quite different Matter of the Milk, while he endeavors to prove by many Reaſons, that Milk is neither made of* Blood *or* Chylus, *but only of the* Serum, as being that wherewith he thinks that all the Spermatic Parts are nouriſh'd: for that the *Serum* ſwimming upon the Blood, by the heat of the Fire thickens into a Jelly, whence it is apparent that it is not only chang'd into Milk, but agglutinated to the Parts that are to be nouriſh'd. Which laſt Aſſertion, which is the Foundation of the Learned Gentleman's Argument, is contrary to Experience. For that *Serum* ſwims upon the cold Blood drawn from the Vein, being ſet in the Sun, or to the Fire, will exhale to Dryneſs, but never turn to a Jelly, unleſs it be faulty. The *Lymphatic Juice*, which as he thinks, differs nothing from the *Serum*, thickens to a Jelly, but how much that differs from the *Serum*, ſee *l.* 1. *c.* 13. Laſtly, Tho' Milk be not made without *Serum*; yet that the *Serum* is only the *Menſtruum* in which the Milky Particles are mingl'd together in Fuſion, and not the Primary Matter of Milk, is ſo apparent from the Subſtance it ſelf of Milk, as alſo from the Butter and Cheeſe that are made of it, and are far different from the *Serum*, that no man in his Wits can queſtion it.

Whether out of Fat.

XXXI. Malpighius *writes, That it may be doubted whether the Milk in the Breaſts may not be made of Fat.* 1. *Becauſe Nature heaps together a great quantity of Fat about the Glandules of the Breaſts in Nurſes and Women that give Suck; which ſeems not meerly to be done for Ornaments ſake.* 2. *Becauſe in Milk when made, there is much Butter contain'd which may be ſeparated from it. But this Opinion is levell'd by the ſole Plenty of Milk, which is daily drawn from all Creatures that give Suck; as in Women, but more eſpecially in Cows, Sheep and Swine.* For this ſame Plenty is ſo great, that if all the Fat of the Breaſts ſhould be diſſolv'd into Milk in one day, it would not ſuffice for half the quantity that is drawn out, nor the Breaſts remain in their perfect Condition: Beſides if Milk were made of the clammy Fat of the Breaſts in thoſe that give Suck, why ſhould not the ſame thing happen in Virgins, and ſuch as do not give Suck; whoſe Breaſts are many times no leſs fat and turnid, than of thoſe that are Nurſes? As for the Milk's containing Butter in it, that proves nothing to the purpoſe, for that the *Chylus* contains Butter in it, and the Blood has Oyly Parts mixt with it, when

when neither the one is made of any Fat in the Stomach, nor the other of any Fat in the Heart.

The Chyle is the Matter of Milk.

XXXII. Martian, Ent, Giffart *and* Deusingius *much more truly assert that the* Chylus *is the Matter of Milk: with whom We also concur, and affirm that the Milk as well in Men and Infants, as in Women, is made of the* Chyle.

The Truth of which is confirm'd by an exact Consideration of the Substance of the *Chylus* and the *Milk*. For if the Milky Substance of the *Chylus* be narrowly lookt into, how very little does it differ from Milk? Between watery Milk and *Chylus* there is little or no difference in Colour, Taste, or Substance. Only the Serosity of the *Chylus* being somewhat separated and wasted in the Glandules of the Breasts, and there will be excellent Milk, and that so much the fatter and thicker, by how much the less of Serosity there is in the Milk, or more dissipated within the Glandules of the Breasts. But if that Serosity of the *Chylus* be not sufficiently separated, then the pure *Chylous* Liquor thin and white, and nothing different from the *Chylus* contain'd in the *Chyliferous* Pectoral Channel (distils out of the Breasts, as we see in new born Infants, as well Male as Female, in whom by reason of the looseness of the Pores and *Chyliferous* Channels, the *Chylus* flows freely to the Breasts; and because the tender and languid Glandules of the Breasts, are not sufficient for the farther preparation of that *Chylus*, hence the *Chylus* reaching thither, flows out of its own accord, or with a slight Compression.

How the Chylus is chang'd into Milk.

XXXIII. *But why and how the* Chylous *Juice is chang'd into Milk in these Glandules, has not been enquir'd into by any one that I know of. The Reason is this All the Glandules through the whole Body, are design'd to separate out of the Blood any Lymphatic Liquor, Spittle in the Mouth, somewhat Bilious in the Liver, Lixivious in the Spleen, &c. and to endue it with a certain slight, subacid Quality, and being so endu'd, to mix it with the Blood,* Chylus, *and other Humors, to the end they may separate 'em by means of a slight kind of Effervescency from other unprofitable Humors, and somewhat coagulate and thicken 'em, to prevent the slight of the most subtle Sulphureous Spirit, and also so to operate, that the sweet Sulphury, Milky Spirits being somewhat more inspissated and clos'd together in the fatty condensed Liquor, may be yet more sweet and white.*

The Milky Juice made more perfect.

XXXIV. For the same Reason also, the Milky Juice (with which in its passage through the inner Milky Vessels something of the Lymphatic Juice is here and there intermix'd) comes to be more perfected in the Kernels of the Breasts; that in them its sweet Sulphury Spirits, through the mixture of a little never so slightly subacid, may be a little more thicken'd or fix'd, and so being more united, may become fatter, whiter, and more fit for the nourishment of the Infant, which, that it is so, appears from hence; for that when that Liquor of the Mammary Glandules, which is to be mix'd with the Milky Juice infus'd into 'em, becomes vicious through any defect, or over-acid, then also the Milk is corrupted in the Breasts, or grows sowre; nay and is sometimes coagulated to the hardness of Cheese, and causes both Inflammation and Exulceration of the Breasts. See more of this *l.* 1. *c.* 7.

Why the Milk fails in Effusions of the Blood.

XXXV. *Here a Question may arise, if these things be true, and that the Milk is not made of the Blood, but* Chylus, *how it comes to pass that in a great Flux of Blood the Milk fails? I answer, That it does not always fail for that Reason, if the Woman eat well: and if it do fail, the Reason is, because that Nature more intent to relieve the greater Necessity, forces the whole* Chylus, *or the greatest part of it, and converts it into Blood, to repair the strength of the whole Body, transmitting very little or none of it to the Breasts.*

To this we may add, That upon the failing of the Blood, there fails also a requisite Influx of Animal Spirits, by means of which the Breasts are loosen'd, and the Chyliferous Passages preserv'd open; and so the Breasts falling for want of those Spirits, or compressed by the weight or thickness of the adjacent parts, the passage of the *Chylus* into the Breasts is stopt up, which causes the Milk to fail.

Why Women that give Suck want their Courses.

XXXVI. *Neither does the foremention'd Aphorism of* Hippocrates *contradict this Opinion of Ours; If a Woman*

man that is neither with Child, nor has lain in, have Milk, her Flowers have left her. For she has not therefore Milk, because that Superfluity of Menstruous Blood flows to the Breasts, and is there turn'd into Blood; but because the Vessels being sufficiently fill'd with Blood, by means of some Lustful Thought, or Libidinous handling of the Breasts, part of the Chyle, *not necessary for the begetting of Blood, flows through the said Passages to the Breasts, and is there turn'd into Blood; and so that Superfluity of Blood, that should have been evacuated by Menstruous Evacuations, is prevented by Nature, to the exoneration of a good part of the* Chylus *in the Breasts, and turning it into Milk, before it be made Blood:* as frequently it happens with Nurses, who have not their Courses for that reason for the most part, and yet are not burden'd with any redundancy of Blood. Whereas if that Milk, in the Woman mention'd by *Hippocrates*, should be made by the Menstruous Blood restagnating, then all Women when their Courses stop'd or stay'd, would always have Milk in their Breasts; when it rarely happens but among salacious and prurient Women, excited by much lascivious Titillation and venereal Thoughts, and consequently the motion of the Animal Spirits, which loosen the Breasts, and open the Pores of the Chyliferous Passages, and so make free way for the *Chylus* to the Breasts. In like manner as by libidinous contrectation and sucking the *Chylus* may be carry'd to the Breasts of some Men who can never be suspected of Menstruous Evacuation, and there be turn'd into Milk: and of such men giving Suck, there are various Examples among the Physicians, of which *Bartholine* has collected some together, *l. e. Anat. Reformat. c.* 1.

Mesue's *Story.*

After the same manner is the Story of *Mesue*'s Woman to be explain'd, who spit Blood, when the Milk fail'd in her Breast; which Blood was stopp'd when her Milk came again. Because the *Chylus* that was wont to flow to the Breasts, flow'd to the Heart, where there happen'd to be too great a quantity of Blood, which for that reason burst out of the vessels of the Head and Lungs, and was evacuated at the Mouth. But afterwards, the greatest part of the *Chylus* flowing to the Breasts, and the Milk returning, then upon the ceasing of the Repletion, the spitting of Blood likewise ceas'd.

Here also lastly may be objected the Example of Cows, who having been foddered all the Winter with Hay, at length coming to feed upon Grass, nevertheless their Milk does not alter and grow fat, till two or three Weeks after, and it contributes another somewhat ruddy colour and grateful Taste to the Butter, which would come to pass the first or second day, if the foresaid Proposition were true, seeing that the *Chylus* is altered at the beginning. I answer, *First*, That what is alledged is not true; for it is not three weeks time before the alteration of the Milk, but the first, second or third day, and it is manifestly apparent in the Colour and Taste of the Butter made the fourth day, tho it be not perfectly conspicuous at the beginning; because the preceding *Chylus* was not then wholly wasted, but mixt with the latter. Besides the very Substance of the Udder cannot be so soon dispos'd to give such a sudden Alteration to the Milk: seeing that Disposition depends upon the Blood which nourishes that Substance: hence it follows that as that Nutrition, so the great Alteration of the Disposition proceeding from it, procures its Effect by degrees, but not in one or two days.

Whether the Animal Spirits be the Matter of Milk.

XXXVIII. *This Opinion of ours concerning the* Chylous *Matter of Milk,* Wharton *seems to prove but in part; for he joyns to it another Matter, of which never any man hitherto makes mention. For he affirms the Milk to be made partly out of* Chyle, *and partly out of a certain Juice flowing from the Nerves, which is mingled with that* Chylus. *But seeing there is no such Cavity in the Nerves, through which such a manifest, thick, fatty, whitish Juice can be thought to pass, but only invisible Porosities, through which no such plentiful Juice, which is to be turn'd into Milk, can possibly flow to the Breasts of Women that give Suck, 'tis apparent that no Liquor can come from the Nerves for the Generation of Milk.* Which is manifest from hence, for that through the copious Conflux of that Animal Liquor through the Nerves to the Breasts, there would be a great dissipation and waste of Animal Spirits in Women

Women that gave Suck, and an extraordinary decay of Strength; whereas Women are more chearful, & better in health when they give Suck than at other times.

A notable Question.

XXXIX. *These things being thus affirmed, there remains a Notable Question to be examin'd, that has so deterr'd most Learned men, that they have rather chosen to pass it over in silence, than to meddle with it. What it is that forces the* Chylus *(that was wont to flow to the Heart) through the* Chyliferous *Channels to the Breasts, for the Generation of Milk?*

Deusingius believes, That the Menstruous Blood, through a certain singular Quality contracted from the Womb, rarefies, and as it were ferments all things in the Body, and causes a Disposition proper for the generation of Milk. This, he says, is communicated to Infants by the nourishing heat of the Womb. But that in Men and Virgins, it is occasion'd by the frequent handling of the Breasts, in like manner as in little Kids, whose Dugs being compress'd by the hands, there presently follows Milk.

But these plausible Reasons fall upon the Rocks by me formerly propos'd, and suffer a total Shipwrack. Nor is that any thing truer which *Deusingius* adds, That the *Chylus* is forc'd toward the Breasts in Women with Child, by a compression of the Stomach and Sweet-bread made by the growing Infant. For which why does not the same thing happen in other Tumors without the *Abdomen*, and when the dead Birth sticks in the Womb, at what time there is the same compression. Some will say perhaps, That there is not the same Lactific Disposition infus'd by them into the Breast. Which is of no moment, for if the aforesaid Compression of the Stomack were requisite to concur with such a Disposition, then such a Compression ceasing from the Birth after Delivery, no *Chylus* would come to the Breasts, and so there would be no Milk generated therein; much less in Virgins and Men that give Milk, in whom such a Compression by the Birth, could never happen. But these things being all contrary to Experience, fall without refutation.

Some have recourse to the Providence of Nature; others to other invalid Reasons: and thus this Mystery has hitherto remain'd in obscurity.

But for the better discovery thereof, we are first to consider, That besides the *Chylus* and an apt Conformation of the Breasts, there is requir'd toward the Generation of Milk, a free passage of the *Chylus* to the Breasts, which we easily conceive in Infants newly born by reason of the softness and the loose Porosities of the Parts. But what should open that Passage in People grown to maturity, which had been stopp'd up for many years, he that can tell this, unlooses the *Gordian*-Knot. Suck or handle the Breasts of a hundred Men, Virgins and Women that do not give Suck, as long as you please, you shall not find the Milk come to all, perhaps not to any, or only to one or two. But why not to all? Because say you, the Breasts of the rest are not sufficiently loose or porous. But the same Women when afterwards with Child evince these reasons, in whom there is then to be found a sufficient laxity of the Dugs.

The true Cause.

XL. *Therefore there is another cause to be sought after, which I take to be a strong Imagination, and an intent and frequent Cogitation of Milk, of the Breasts, and of their being suckt; which works wonders in our Bodies; not simply of it self, but by virtue of the appetitive Power, or of the Passions of the Mind, which occasion various motions of the Spirits and Humors.* Thus the Imagination and Thought of an extraordinary Danger makes a man tremble, fall down, grow cold, and fall into a Fit, and sometimes occasions the Hair to grow grey on a sudden. Glad Thoughts revive and warm the Body. Obscene Thoughts occasion Blushing; and Thoughts of Terror occasion Paleness. Venereal Thoughts diffuse Heat through the whole Body, loosen the Genitals of Women, stiffen those of Men, and open the Seminary Passages, otherwise invisible, in such a manner, as to occasion spontaneous nocturnal Pollutions.

This intent Imagination and desirous Thought of giving the Infant Suck, is the reason why the Chyliferous *Passages to the Breasts are dilated and open'd*, especially if some other external Causes contributing to the same purpose, cherish and excite those strong Imaginations, as lascivious Titillation of the Breasts, the stirring of the Child in the Womb, or sucking of the Nipples: For according to the various Influx of the Animal Spirits, the parts are sometimes streightned, sometimes loosen'd, as every body knows; and according to that various Constriction

Constriction or Dilatation, the Blood and other Humors flow more or less into the Parts: and are sometimes the occasion of Heat, Softness, Redness; sometimes of Constriction, Coldness and Paleness. Among these impuls'd Humors is the *Chylus*, which is continually thrust forward by the Muscles of the *Abdomen*, through some Lactiferous Vessels, and so through those Vessels that tend to the Breasts, provided that a special Influx of the Animal Spirits have loosen'd those Parts through which those Vessels are carry'd, and has render'd those Vessels penetrable, by removing all manner of Constriction.

Now that this is the true Cause, is apparent from that man mention'd by *Santorel*, who, upon the Death of his Wife, when his Poverty would not give him leave to hire a Nurse, that he might still the Cries of the Infant, would often lay the Child to his Breasts (no doubt with an ardent desire to give it Suck) and so at length through that intent, continual Cogitation, and often iterated sucking of his Teats, the *Chyliferous* Passages were loosned, and his Breasts afforded Milk sufficient for the nourishment of the Infant. The like Accident hapned at *Viana*, where the Woman of the *Bores-Head* was brought to Bed not long after the Death of her Husband, and soon after her Delivery dy'd, very poor her self, leaving the Infant sound and healthy; of which the Grandmother taking Compassion, and not able to hire a Nurse, by reason of her Poverty, undertook to bring it up by hand, in the 60th. Year of her Age; at what time putting the crying Infant to her Breasts, and giving it her Nipples to suck, through that force of Imagination and eager desire to suckle the Child, her Breasts began to give Milk, and that in a few days so plentifully, that the Infant wanted little other Diet, to the great admiration of all that saw the Infant suckled with the Milk of an Old Woman, whose Breasts had been fallen for many years. Many such Examples of Old Women giving Suck, *Bodin* relates in his *Theat. Natur.* And the Truth of this Cause is no less evinc'd by lascivious and prurient Virgins, who are full of Libidinous Thoughts, and therefore often handling their Breasts, sometimes without the loss of their Virginity, come to have Milk in them; of which sort of Milk-bearing Virgins of undoubted Honesty, I happen'd to see two; *Bartholin* witnesses another seen by himself; and we find several Examples of Women yielding Milk in *Vega*, *Schenkius*, *Caster*, *Castellus*, and others, collected by *Bauhinus*. Neither will any man question but that such like lascivious Thoughts of their own Breasts, and handling 'em, has also produced Milk in the Breasts of Men. But in Women with Child, the stirring of the Birth in the Womb excites every day more and more those Thoughts of suckling the Infant, and hence when the Infant begins to move sensibly, then the Milk begins to appear in the Breasts.

An Observation.

XLI. I shall add a manifest Domestic Example. My own Wife in *March* 1636. had in her lying in a sufficient quantity of Milk, according as she was wont to have; but the Infant for six or seven Weeks was so weak, that it could not suck, so that every one thought it would have died, and she not dreaming any more of suckling it, her Milk dry'd up: But when afterwards the Child recover'd and was able to suck, and my Wife had no Milk in her Breasts, the Child was of necessity to be put out to Nurse: But the Nurse proving bad, my Wife, nine Months after her Delivery, sent for the Child home; and while another Nurse could be found, would often lay the crying Infant to her Breast, wishing her self in a condition to suckle it. The next day the Child was sent to another Nurse; but that Evening, through that same strong Imagination and Thoughtfulness, her Breasts that had been dry'd up for above Eight Months, began to swell and be full of Milk, so that had not the Nurse been hir'd, she could have suckl'd the Child her self, which proves that strong Thoughts and Imaginations are the first Cause that move the *Chylus* to the Breasts.

But some will say, if this were true, then in those Women that have no Milk in the Flower of their Age after being brought to Bed, such ardent Desires to give the Child Suck, would bring Milk into their Breast, but no such thing happens, tho' they desire to suckle the Infant. I Answer, That all Thoughts are not so intent and strong as to move the Affections of the Mind; without a vigorous stirring of which, the Animal Spirits are not so impetuously mov'd: and hence the Thoughts of Suckling the Infant, tho' they frequently occur to the Womans mind, yet if they do not happen with a violent and continual

Intentneſs, the Animal Spirits cannot be ſo copiouſly determin'd toward the Breaſts, as to be able to dilate and remove the Impediments of the Veſſels tending thither. Beſides that many things may happen which may hinder the paſſage of the *Chylus* to the Breaſts, notwithſtanding the preſent ardent deſire and ſtrong imagination of ſuckling the Infant: as ſcarcity of *Chylus*, thickneſs of the Breaſts, obſtruction of the Kernels by viſcous Humors, by Exulceration, Fall, Blow, or other Miſchance, or a natural Streightneſs of the Milky Veſſels tending to the Breaſts, or compreſſion from the neighbouring Parts; and then the Effects of Thought and Imagination are fruſtrated.

Why the Milk increaſes the fourth day after childbirth.

XLII. *Hence it appears why Child-bearing Women have ſuch plenty of Milk the Third, Fourth or Fifth Day after Delivery: Becauſe that being tir'd with their Labour, for the firſt Two or Three Days, they do not much employ their Thoughts upon any thing; and for want of Appetite, eat little, and breed leſs* Chylus, *but the next days following, when they eat more, and the Infant begins to cry more, then they alſo continually think of giving it nouriſhment, and deſire to ſatisfie the Crying of the Child, and through this Affection, the Paſſages being looſen'd by the determin'd Influx of the Animal Spirits, the* Chylous *Juice that was formerly carry'd to the Womb, is now turn'd to the Breaſts.*

A Queſtion.

XLIII. *To conclude, I ſhall only add one Queſtion worth Examination: Why upon the weaning of the Child, the* Chylous *Juice is no longer carry'd to the Breaſts, but the Milk is dry'd up? It is becauſe the Woman lays aſide all thought of giving Suck, which the more ſpeedily ſhe does, the ſooner and the better are her Breaſts dry'd up*; for that then the more copious Influx of the Animal Spirits to the Breaſts, fails; by which the Glandules of the Breaſts, and the *Chyliferous* Veſſels tending thither, were dilated; and hence the Glandules then fall and are contracted, and the ſaid *Chyliferous* and Milky Veſſels are compreſs'd by the weight of the adjacent parts; ſo that there can be nothing more through thoſe convey'd to the Breaſts, and then that part of the *Chylus* that was wont to be convey'd thither, in Women with Child is convey'd to the Womb, in others to the Heart, there to be chang'd into Blood; which becauſe the Body does not want in ſuch abundance, hence it comes to paſs that Women are leſs hungry and thirſty than when they gave Suck, and ſo they breed leſs *Chylus*, and what Blood is bred ſuperfluous in the mean time in Women with Child, contributes to the Birth, in others is evacuated through the Womb.

Why the Breaſts are dry'd up upon weaning.

XLIV. *But ſome will ſay, Where remains that Milk, which upon the firſt weaning remains in great plenty in the Breaſts, and is not ſuckt out? Why is it not coagulated and corrupted, and conſequently does not breed Inflammations and Apoſtemes?*

I anſwer, it is carry'd by degrees through the Mammary Veins, to the hollow Vein, and ſo to the Heart, in like manner as the *Chylus* pour'd forth out of the *Chyliferous* pectoral Channel into the ſubclavial Vein, flows together with the Veinal Blood to the Heart. But whether that Milky Juice be carry'd to the Heart through the Mammary Veins extraordinarily in Women giving Suck, eſpecially ſuch as abound with Milk, I leave to conſideration; ſeeing that the remarkable Number and Bigneſs of the Veins, and the ſmall Number and Bulk of the Arteries ſeem to perſwade the contrary.

What drives the Chylus *to the Breaſts in Beaſts.*

XLV. *In oppoſition to this Opinion of ours, one notable Doubt ariſes; How it comes to paſs that in Cows, Mares, Ews, Goats, and other Creatures the Milky* Chylous *Juice flows in ſuch abundance, and ſo conſtantly to the Udder, ſeeing that being depriv'd of Rational Souls, they are no way capable of Imagination, Thought, Intellect, Memory, Will, Judgment,* &c. True it is our Modern Philoſophers that follow *Carteſius*, acknowledge no ſuch noble Actions as theſe in Brutes; or if they ſeem to perform ſome Actions like to theſe, they believe they neither can nor ought to be number'd into the Rank of principal Actions, as not being perform'd by a Rational Soul, but affirm 'em to proceed only from a certain kind of Motion of the Spirits induc'd by the Objects, and flowing from the propriety of the Diſpoſition of the Parts. And thus they alledge that

that in Brutes certain Diſpoſitions of the Spirits and the reſt of the Parts are induced by the Objects, from which certain kind of Motions reſult, in reference to which the Pores ſometimes of theſe, ſometimes of thoſe Parts are opened and ſhut through the greater or leſſer, ſlower or ſwifter, ſtronger or gentler Influx of the Spirits. And in this caſe now propoſed by us they would thus argue, *viz.* In a Cow, by reaſon of the great Commotion of the Birth in the Womb, or the Pain of bringing forth, the Pores are opened about and toward the Udder, and ſo by the Influx of Animal Spirits the Paſſages before ſhut are dilated, ſo that the *Chylous* milky Juice is at liberty to flow thither more freely through its proper Veſſels. Which Laxity of the milky Paſſages continues long after bringing forth, becauſe of the continu'd opening of the Pores wider than uſual toward the Udder, and the more Copious Influx of the Animal Spirits, and continued by the tickling Motion about the Udder induced by the graſping of the Calf that ſucks, or the Hand of the Milkmaid.

But in regard the Object cannot of it ſelf induce any ſenſitive Motion, unleſs it be firſt known either as Good or Evil, and this Knowledg and Perception preſuppoſes *ſomething knowing*, far different from the Object to be known (for being taken without Knowledg and Preception, no Motion can be ſaid to be made by its means; as in thoſe that are troubled with a *Catalepſie*, into whoſe Organs both ſenſitive and moving, tho well form'd and furniſhed with Blood, Heat, and Spirits, tho the Objects fall, they cauſe no Motion, becauſe they are not perceiv'd; and conſequently there are no new Determinations of the Spirits to various Parts, nor no alterations of Motion.) Furthermore ſeeing the Property of the Diſpoſition of the Parts, neceſſarily preſuppoſes ſome peculiar Diſponent, which induces to that proper Diſpoſition, and alters it according to the nature of the Thing; and even the motion of the Spirits it ſelf preſuppoſes alſo ſome firſt mover, perceiving and knowing the Object (for nothing knows, moves, and diſpoſes it ſelf without a Cauſe) it ſufficiently appears, that ſuch an Explanation neither ſuffices nor ſatisfies, eſpecially if we conſider over and above that moſt brute Animals perceive and diſtinguiſh Pains, Smells, and Taſtes, covet things grateful, perceive, know, and avoid things grateful as ſuch, know their Friends from their Enemies, *&c.* Which moſt certainly are no Operations of the Diſpoſition of the Parts mov'd by Objects; but of ſomthing perceiving the Objects, and ſo diſpoſing the Parts to perform ſuch and ſuch Actions. As in Man a Brain well form'd and temper'd, and full of Animal Spirits is not the primary Cauſe of the principal Actions, but the Rational Soul, which makes uſe of the Brain and Spirits as Inſtruments, and ſo diſpoſes the Brain, that ſometimes theſe, ſometimes other Pores are more or leſs opened and ſhut, and fewer or more plentiful Spirits ſometimes determin'd after this or that certain manner through thoſe open Pores; and conſequently theſe, ſometimes others, and many times ſeveral principal Functions operate together. Or as an Organ ſufficiently furniſhed with Pipes, Bellows, and Wind, cannot by virtue of any Object, or by its own proper Diſpoſition ſing any muſical Songs, unleſs by the Aſſiſtance of the Organiſt, who directing the Keys with his Fingers determines the Wind ſometimes into theſe, ſometimes into other Pipes, and ſo produces a grateful Harmony. Thus alſo in Brutes, beſides the Objects and the proper Diſpoſition of the Brain and other Parts, there muſt be of neceſſity ſomething elſe over and above, which perceives the Objects, and produces ſuch wonderful Operations out of thoſe Parts. It is here in vain alledged that ſimple Natural Affections, as Hunger, Thirſt, Joy, Sadneſs, want in Brutes no other Inſtructor, than the Inſtinct of Nature: Concerning which *Tho. Willis* writes many things, but little to the Dilucidation of this matter. As if that ſame natural Inſtinct did not want an Inſtructor as well in Brutes as in Men: For as Man is never a hungry, but when he perceives that troubleſome Vellication of the Stomach; who will believe that Brutes are ſenſible of Hunger without that Vellication? Or if they perceive by Inſtinct without any other Teacher, let us know what that Inſtinct is which perceives without a Teacher, and how it operates that Perception? Which if it be not that rational Soul, of which Brutes are depriv'd, what is it? We will call it for the preſent *ſomething Analogous to the Rational Soul*, which in Brutes operates a kind of Underſtanding, Memory, Knowledg, with ſomething of obſcure Judgment after their manner, or ſome ſuch like thing. For Brutes are not mov'd, nor do they act like Engines mov'd by Clock-work, as moſt of our modern Philoſophers

endeavour'd to inculcate, *Regius*, and *Florentius Schuyl* among the reſt. For Engines mov'd by Clock-work neither feel Pain, nor hear, nor ſee, nor come when they are call'd, nor fly thoſe that threaten 'em; all which Operations are obſerv'd in Beaſts: And then ſays *Iſaiah*, *The Ox knows his Owner, and the Aſs his Maſters Cribb.* And *Jeremiah*, *The Kite knows his Time, the Turtle, the Swallow, and the Stork, know the Seaſons of their Coming.* Thus a Dog knows his Maſter and the Servants from Strangers, fawns upon his Friends, barks at his Enemies, and after his manner underſtands and executes the Commands of his Maſter. He dreams in his Sleep, and barks in his Dream. In hunting alſo he ſeems after a manner to argue; for coming where three ways meet, after he has examined two, and finds the Game not gone either of them, he takes the third without farther Examination; as if he had thus reaſoned with himſelf, *The Game muſt be gon either that way, or that way, or this: But neither that way, nor that way, therefore this way.* Thus *Rocarius* reports a notable Story of a Dog that belong'd to a peculiar Friend of his, which happened in the Court of Cardinal *Alexander*. This Friend of his went a hunting alone one time with his Dog, and following his Game with great heat in a ſolitary Wood, fell at length into a deep Pit, where he had periſhed inevitably but for his Dog: For the Dog having loſt his Maſter return'd immediately home, fill'd all the Houſe with his Howling and Whining, and by running out a doors and returning again, intimated a kind of eager deſire that ſome body ſhould follow him, which the Cardinal obſerving, and perceiving that the Owner of the Dog was miſſing, ordered ſome Perſons to follow the Dog, and by him being led directly to the Pit, there they found his Maſter and drew him out. Who taught this Dog to leave his Maſter to ſeek for human Help, to return home, to teſtify his Sadneſs by his whining, to urge the Servants to go along with him, to carry them to the Pit, and to ſhew them his Maſter fallen into it? Only the Object: Oh the wonderful force of Objects that teaches Beaſts to reaſon in this manner. A Mare knows her Enemy the Wolf, and ſtoutly defends her Foal from his Seiſure. Eagles being to encounter Harts as *Rocarius* teſtifies, firſt by their fluttering up and down gather the Duſt into their Feathers, then flying over the Hart, they ſhake the Duſt into the Eyes of the Stag, to the end that being blind he may run headlong and fall from the Precipice. A wild outragious Panther, by the Teſtimony of the ſame Author, whoſe Young accidentally fell into a Pit, from whence ſhe knew that only Human Help could recover them, as it were guided by ſome kind of Reaſon, beſets a Road leading three ways expecting ſome Man to paſs by; at length lighting upon an unwary Traveller, ſhe fawn'd upon him, and laying her Paws upon him, gently lead him, willing as he was to go, to the Pit; out of which, after he had taken her young ones, the cruel, yet grateful, wild Beaſt, for the Kindneſs done her, guarded the Traveller through the midſt of the Deſart, back again to his Road, and diſmiſſed him without the leaſt harm. The cruel and hungry Lion in *Gellius* knew *Androclus* again that had formerly pull'd a Thorn out of his Foot, and was ſo far from tearing him, that by his outward Geſtures he ſhewed him all the Kindneſs imaginable, walk'd about the City with him, and obey'd him as his Servant, for being formerly his Surgeon. The Doves carried out of *Holland* into *England*, and there kept Priſoners a while, flew back, when ſet at Liberty, into *Holland*, and in two days return to their old Dove-houſe, as *Monſieur Abeels*, a Merchant, well known among us, can teſtify. A Stork makes cruel War with another Stork for having poſſeſſed her Neſt, and in concluſion either wounds or kills her, and throws her Chickens and her Eggs out of the Neſt: And the ſame Bird knows by the Conſtitution of the Air, when 'tis ſeaſonable to fly into remote Regions, and when to return. The ſingular Subtlety of Apes is diſcovered by their Actions. The Elephant does many things to a Miracle, as if endu'd with Reaſon. I omit the wonderful Induſtry of Ants, or to tell with what Art Birds build their Neſts, Spiders ſpin their Webs, and Bees build their Combs, and gather their Honey. All which things could never be done without ſome kind of Underſtanding, Knowledg, Memory, and Judgment, or at leaſt ſomething analogous thereto, tho they are not perform'd with equal Perfection in all Creatures; for as that ſame analogous Reaſon, is in ſome more Excellent and Vivacious, as the Organs are more or leſs fitted; ſo ſome Beaſts differ from others in acuteneſs of Wit, in Underſtanding, Memory, Docilitie, and Stupidity. Hence our Saviour himſelf aſcribes

ſcribes to ſome Creatures a ſort of Knowledg or Underſtanding, where he ſays, *Be wiſe as Serpents, but innocent as Doves.* Now I would fain know how ſimplicity of Mind or Prudence can be in ſuch Creatures without ſome kind of Underſtanding. Tho theſe Operations are more Imperfect in Brutes than in Men: In whom alſo they are ſometimes ſufficiently imperfect of themſelves; as in Men that have been expoſed in Deſarts, and bred up by wild Beaſts; who being afterwards taken by the Hunters, have differed little from wild Beaſts but in Shape, of which we have ſeveral Examples in *Pliny, Goulartius, Dreſſer, Camerarius* and others, who nevertheleſs by convenient Education and Exerciſe attain the higheſt Pinacle of Perfection; which ſlight Shadow only of Perfection, tho far different from rational Perfection, moſt manifeſtly appears in Brutes, which nevertheleſs ought of Neceſſity to have ſome Cauſe. And therefore it is apparent from the Reaſons foregoing that no Motion can be raiſed up in Brutes, unleſs Good or Bad be perceiv'd, and if they be in ſuch a manner perceiv'd, there muſt of neceſſity be within 'em ſomething *Perceiving* and *Knowing*: Nevertheleſs it does not follow from hence (what our Adverſaries inferr) that if there be any Underſtanding and Knowledg in Brutes, therefore they muſt have a Soul, and that no leſs immortal than the Soul of Man. For that they have a feeling and perceiving Soul muſt be granted, but that it is immortal like the Soul of Man we plainly deny. For the Difference of thoſe Souls, and the Difference of the Original teach the contrary. Scripture therefore, Reaſon, and Experience teach us that there is ſomething to be allow'd to Beaſts which is Analogous to Reaſon, but mortal however. Which is perſpicuous from this one thing, that ſome Creatures run Mad, as Apes intoxicated, Dogs and other Creatures diſtempered with a Hydropholie; which Madneſs could not happen to Creatures that underſtood better in their natural Condition, for natural Ability and Impotency muſt be referred to the ſame Subject. And here that Inference is of no Value, That a Mad-man, is not mad according to his Rational Soul, but according to the inner Sences which the Beaſts have common with him, which operate rightly or amiſs, as the Organs are well or ill diſpoſed; and ſo Brutes alſo run mad according to thoſe Sences, and not according to any Soul. This Objection does no way deſtroy the Exiſtence of ſome kind of mortal Soul in Brutes, in ſome meaſure Analogous to the immortal Mind, and as it were a kind of Shadow of it; but rather it proves in Man beſides the rational incorruptible Soul, that there is yet within him another corruptible Soul, common to Brutes, perfecting the Operations of the internal Senſes, called the *Vegetative* and *Senſitive*, which of neceſſity muſt be in Man, as we have proved *l.* 1. *c.* 29.

See l. 1. *c.* 28, 29.

The learned *Willis* labours very much in diſcovering and explaining the *Percipient*, and after he has largely unfolded it, how the Images of Objects are form'd and imprinted in the Brain, by the running backward and forward, Motion, Repercuſſion. *&c.* of the Spirits, at length altogether Doubtful, ſays he, *However we are yet to enquire what kind of Power that is, which ſees and knows ſuch like Images delineated there, and alſo according to thoſe Impreſſions there received chooſes, deſires, and exerciſes the reſpective Acts of other Faculties.* But that he may diſingage himſelf out of this Perplexity, he ſays, 1. That there is an Innate Knowledg in Brutes, infuſed by the ſupreme Creator, and implanted in their Principles or Natures from their firſt Formation, for certain Uſes neceſſary for the Propagation of Life, which vulgarly uſes to be call'd *Natural Inſtinct*. 2. That there is within 'em a certain acquir'd Knowledg by the Impreſſions of ſenſible things, by Imitation, Experience, human Teaching, and by other means learnt by degrees, and which arrives in ſome to a higher, in ſome to a leſſer degree of Perfection. In the following Paragraphs he diſcourſes at large concerning both theſe ſorts of Knowledg, and thus he believes he has ſufficiently extricated himſelf out of his Labyrinth, when in the mean time he never does nor can explain, what or what ſort of Being, or what thing that *natural Inſtinct* is, and whence that acquir'd Knowledg proceeds, which cannot proceed but from ſomething *Knowing*, which ſomething *Knowing* had he explain'd together with *natural Inſtinct*, all this Cloud of Obſcurity had been ſcattered: But now relying only upon Names and Words, he leaves his Readers as much in the Dark as they were before.

All which things when *Galen* had excellently well conſider'd, he writes, That Brutes are not altogether void of Reaſon,

Reaſon, capable of Affections: And believes that ſome ſort of Reaſon, tho to ſome leſs, to others more Liberally is to be allow'd to Brutes. Wherein *Galen* agrees with *Ariſtotle*: *In Men*, ſays he, *there is Wiſdom, Prudence, and Art, ſo likewiſe in ſome Brutes there is a certain other Nature of this Sort*: And in another place, *There is in ſome Beaſts Urbanity, Savageneſs, Clemency, Cruelty, Fortitude, Sloth, Confidence, Anger, Malice, and an Image of Prudence.* Thus alſo by the Report of *Bodin*, the moſt learned Philoſophers, *Chryſippus, Porphyrius, Dion, Solin, Plutarch*, and others have confirm'd a ſort of Reaſon allow'd by Nature to Beaſts. With whom *Hugo Grotius* aſſents, *l.* 1. *de veritat. Relig. Even Beaſts exerciſe ſome Actions ſo orderly and well directed, that they ſeem to proceed from a kind of Reaſon which appears cheifly in Ants and Bees: but is manifeſt alſo in other Creatures, that fly things hurtful, and ſeek thoſe things that are profitable.* This ſort of brutiſh Reaſon *Ariſtotle* calls *Reaſon by Participation*, or *Paſſive Underſtanding.*

Neither is this Opinion contradicted by that other Text of Scripture, *Be not like the Horſe and Mule that wanteth Underſtanding.* For there, by Underſtanding is to be underſtood an acute and rational Underſtanding. Thus we uſually ſay of Men that are Blockiſh, Fools or Mad-men, that they want Underſtanding; becauſe their Intellects are not ſo acute; whereas nevertheleſs they know and diſtinguiſh Objects after their manner, as appears by their Actions. Moreover, ſeeing that both Men and Brutes do know, theſe perfectly, the other leſs perfectly, of neceſſity we muſt diſtinguiſh between the rational Intellect, which belongs only to Men; and the Intellect of Brutes, far inferior and more imperfect than the other, and which never can be brought up to the perfection of Rationality.

What is that ſomething Analogous to the Rational Soul.

XLVI. But what that *Something Analogous to the Rational Soul*, is, no man could hitherto ſufficiently unfold. *Julius Cæſar* thinks he has diſcover'd a ſufficient Explication, by calling it *Common Sence*, which is in the midſt between all the external Senſes, and collects their Multiplicity into one. Others think it to be nothing that ſubſiſts of it ſelf, but only an Accident and Modification of Subſtance, that is to ſay, ſuch a diſpoſition of the Brain and Spirits induc'd by Heat, which cauſes Beaſts to live and feel after their manner. But after that manner the *Mediums* are only to be underſtood by which the Act of perceiving is perform'd, nor does it teach us what that *Medium* is which perceives ſuch *Mediums* in Brutes after their manner. For example, when a Man ſees, he wants Heat (for a congeal'd Eye does not ſee) and a convenient diſpoſition both of the Brain and Eye: but there is ſome other thing which cauſes him to ſee viſible things through theſe *Mediums*, that is, the Soul. But ſeeing Brutes alſo feel and perceive things viſible, audible and tangible, of Neceſſity alſo in them, beſides heat and convenient Organs, there muſt be ſomething Percipient and *Analogous to Reaſon*, by which the Act of perceiving is perform'd. Now whatever that is, it manifeſtly appears, that it is ſomething ſingular in Brutes, which was created by the Supream God at the beginning, together with the World, and infus'd and mix'd with the Matter of the World, which in Brutes is again extracted out of Matter, and proceeds into manifeſt Act: but in the mean time the moſt excellent of the Matter is produc'd exceeding the common Condition of the mixt Matter, which ſo manifeſtly operates thoſe nobler Actions in Brutes, and frequently in ſome ſeems to imitate the Actions of the Mind. And this is that which we think is to be underſtood by *Analogous to Reaſon*, which we can better admire at than explain.

Whether Analogon be the ſame with the Rational Soul.

XLVII. *Yet no man in his Wits will call this* Analogon *the Rational Incorruptible Soul, ſince it proceeded from Corporeal Corruptible Matter, and is propagated by Generation, and not only operates imperfectly, but is alſo corruptible, and periſhes with the Body:* whereas the Rational Soul did not proceed from the Matter of the Body, but was created apart by God, and by him infus'd, operates perfect Actions, is incorruptible and immortal, and is ſeparable from the Body, and not only extends its Actions much farther than that corruptible *Analogon*, but to Infinity. According to that of the Heathen Prince of Philoſophers, *It remains that the Mind alone comes from without, that ſhe is only Divine (for no Corporeal Act communicates with her Actions.* For ſhe contemplates not only the Subſtances of Things, but Things alſo diveſted of their Subſtances. She comprehends Knowledge, beholds the Inviſible God, reaches to the Seats of the Bleſſed,

Bleſſed, dives into the Nature of Offices of Angels with admiration; ſhe contemplates her ſelf, and knows what ſhe is joyn'd to the Body, and what abſtracted from it; views things long paſt as preſent; examines Futurity, and what will never be, Poſſibilities and Impoſſibilities, and endeavours to comprehend things innumerable and infinite. None of which Operations are perform'd by the *Analogon*. Which being Corporeal, contemplates only things Corporeal.

Concerning this Matter has the Learned *Willis* written moſt elegantly; who after he has alledged the knowing Faculty of the Corporeal Soul to be Fancy or Imagination, which comprehends corporeal things under an appearing Image only, and not always under a true one, at length in theſe Words, *But indeed, ſays he, the Intellect preſiding over the Imagination, beholds all the* Species *depoſited in its ſelf, diſcerns or corrects their Obliquities or Hypocriſies, ſublimes the Phancies thence drawn forth, and diveſting it from Matter, forms univerſal Things from ſingular; moreover it frames out of thoſe ſome other more ſublime Thoughts, not competent to the Corporeal, ſo it ſpeculates both the Nature of every Subſtance, and abſtracted from the Individuals of Accident,* viz. *Humanity, Rationality, Temperance, Fortitude, Corporeity, Spirituality, Whiteneſs, and the like; beſides being carry'd higher, it contemplates God, Angels, its Self, Infinity, Eternity, and many other Notions far remote from Sence and Imagination. And ſo as our Intellect, in theſe kind of Metaphyſical Conceptions, makes things almoſt wholly naked of Matter, or carrying it ſelf beyond every viſible* Species *of Matter, it conſiders them wholly immaterial: this argues certainly, that the Subſtance or Matter of the Rational Soul is immaterial and immortal. Becauſe if this Aptneſs or Diſpoſition were corporeal, as it can conceive nothing incorporeal by Sence, it ſhould ſuſpect there were no ſuch thing in the World.*

The ſaid Analogon is the more excellent Spirit.

XLVIII. Therefore the foreſaid *Analogon* is the more excellent Spirit inſtructed by Nature, produc'd out of corporeal Matter, far exceeding the Condition of other Spirits produc'd out of Matter, which *Ariſtotle* affirm'd to participate of the Nature of the Element of the Stars: alledging that there is contain'd in every Seed a certain Spirit nobler than the Body, which in Nature and Value anſwers to the Element of the Stars, by which the Formation of the Birth in Brutes, and other Actions are perform'd. This is that Vivific Spirit, which no man hitherto could perfectly deſcribe. Which being drawn forth out of the Matter by Heat diſſolving the Matter, acts again upon the Matter, and variouſly diſpoſes it, in ſuch a manner, that beſides many other Actions, it produces the Nobler Actions in Brutes. But this Diſpoſition of the Parts, which is an Effect of this Spirit, or rather of Nature latent in the Spirit, and the *Medium* by which it operates, Modern Philoſophers, contrary to Reaſon, conſtituted to be the Efficient Cauſe of the ſaid Operations; and ſo have made the Fabrick of Brutes like the Fabrick of Engines moving by Clockwork; not conſidering that the appropriated diſpoſition of Wheels and other parts in them, proceeded not either from the Engine it ſelf, or from the Concoction, Blowing or Motion of the Air, Fire or other Matter, but from the Hand of ſome Artificer, who by that diſpoſition carries on that Motion which he deſign'd in the Engine. For Example ſake, the Wheels and other Parts of a Clock are ſo diſpos'd as to ſhow the Hours, yet will it be of no uſe as to that purpoſe unleſs the Artificer pulls up the Weight at prefix'd times, and makes the Clock go ſlower or faſter, according as the Weights are either lighter or heavier, which he hangs on. So in Brutes, though the Parts be proportionable and well diſpos'd for the performance of Actions, yet unleſs there be ſomething to change and excite thoſe Parts to their deſign'd Operations, they will act nothing. So that Action proceeds neither from the innate diſpoſition of the Parts, nor from the Objects; but from hence, that it knows and perceives the Objects and incites the diſpos'd Parts to various Operations; which being but ſlightly conſider'd by ſome, was the reaſon that they underſtood not that the Propriety of Parts in Brutes requir'd likewiſe ſome more noble Artificer to direct that diſpoſition, and to be the Cauſe and Author of it, and of the foreſaid nobler Actions.

And by reaſon of theſe Operations of the Fancy in Brutes, as in Mankind, proceeds that more copious Influx of the Animal Spirits in Brutes, and conſequently their continu'd Generation of Milk.

An Objection refuted.

XLIX. Hence it appears how ill they argue, who denying all Knowledge and Underſtanding in Brutes, alledge, 1. That

Brutes,

Brutes, seeing there can be no thinking Substance assign'd to 'em, are depriv'd of all Sences. 2. *Every thinking Substance is immortal.* 3. *There is no Sence without Conscience.* 4. *No Conscience without the Thing thinking.* 5. *No Thing thinking without any Rationality.* 6. *No Rationality without Immortality.*

The refutation. L. The first is to be contradicted by every Ploughman; for who will presume to deny, That Beasts do excel some more, some less in all the five Sences? Who dares say, That their Organs of Sence were assign'd 'em to no purpose by the Supream Creator; or that they know not what is hurtful, and what is for their Benefit and Advantage. To the *Second*, we have already answered, That though such Actions cannot be perform'd without some thinking Substance, yet is it not requisite that that Substance should be Immortal, but something Analogous. The *Third* and *Fourth* we grant to be true; yet we must distinguish in the mean time between the *Thing Thinking*, which is imperfect and mortal, *&c.* and the *Thing Thinking*, which is immortal and perfectly rational; of which, the first is but a certain *Analogon*, or slender Shadow; which proves the Falshood of the *Fifth*, when some *Thinking Thing* may be without perfect Rationality; though, as the *Sixth* says, no perfect Rationality can be without Immortality.

And so much for these Things; having been more prolix in the Examination of Lactification, by reason of the Obscurity of the Subject. And here might be added a farther Discourse of Milk, as it consists of diverse Parts, *Caseous*, *Butirous*, and *Serous*; but I shall stop here, for fear of transgressing too far beyond my Bounds.

CHAP. III.

Of the Diaphragma.

I. *WE now go to the Inner containing Parts of the Middle Belly, among which comes first to be consider'd that same remarkable Inclosure which the* Greeks *call* Diaphragma, *from* διαφράττω, *to distinguish; by the* Latines, *Septum Transversum*, or *the overthwart Inclosure, because it distinguishes the Trunk of the Body into two Bellies.* Aristotle *calls it* διάζωμα, *or the Girdling*, περίζωμα, *and* ὑπόζωμα: *but* Macrobius *calls it* Dissleptum. *By* Hippocrates *and many of the Ancient Physicians, it is call'd* φρὴν *and* φρένες, *that is the Mind; because that being out of order, the Mind and Senses are disturb'd: and for that the Sences go beside themselves when it is inflam'd.*

The names.

II. *It is a Muscle serving for the Use of Respiration with other Muscles of the Ribs, in shape almost circular, and much varying in Situation from the rest of the Muscles, answering in bigness to the overthwart largeness of the Lower Breast.* *'Tis a Muscle.*

III. *It consists of a fleshy Substance, in the middle for the better strengthning of it, membranous and nervous, to which Mediety run forth fleshy Fibres from the Periphery of the Breast, as to the Center*; to which Center all Wounds that reach, are esteemed mortal. But *Galen* affirms, that Wounds in the fleshy part of it, are not mortal; which *Holler*, *Jacotius* and *Alexander Benedict* confirm by Examples, and which we have also experienc'd in Practice. *The Substance.*

IV. *It is invested with a double Membrane; the uppermost of which is the expansion of the* Pleura, *to which the* Mediastinum *and* Pericardium *stick close, and sometimes, but very seldom the Lobes of the Lungs, by means of little Fibres. The lower Membrane joyns to the* Peritonæum. *The* Membranes.

V. *Being fasten'd to the Ribs on both sides the lower part of the* Sternon, *and to the* Cartilago Mucronata, *it is spred over the* Thorax, *and about the* Vertebræ *of the Loyns, it is stretched forth first into two Fleshy, then two Tendinous Portions, strongly fasten'd to the said* Vertebræ, *and descending to the* Os Sacrum, *through which the Great Artery descends, with the Nerves of the Sixth Pair apply'd to the Ribs, and the Vein* Azygos *ascends.* *The site and connexion.*

From

From theſe Portions, many with *Galen*, deſcribe its Original; others from the Sword ſhap'd Griſtle; others with *Fallopius*, from the Extremities of the Ribs; others, with *Vealius* and *Sylvius*, from the middle membranous Center into which the Nerves enter. Which laſt Opinion diſpleaſes, to whom that Membranous Part ſeems rather to be one general *Tendon* of all the Fibres ſtanding round about: but the Inſertion of the Nerves into the Nervous Part, ſhews the contrary, as being always inſerted into the Head of the Muſcle.

The Holes. VI. *It is penetrable about the middle on the right hand for the Paſſage of the* Vena Cava, *on the left hand for the Paſſage of the Gullet and Stomach-Nerves.* As for the *Aorta*, that does not penetrate the *Diaphragma*, but reſting upon the *Vertebræ*, it is comprehended by it, as it were within a Semi-circle.

Veſſels. VII. *It has two Arteries, call'd* Phrenic Arteries, *from the Trunk of the great Artery adjoyning to it: It has alſo two Veins, call'd* Phrenic Veins, *carrying back the Remainder of the Blood after Nouriſhment, which it inſerts into the Trunk of the hollow Vein. It receives three remarkable Nerves, diſperſed through the whole Subſtance of it; from the Fold of the Nerves of the Neck, and the Branches of the ſecond Vertebral pair in Men, and the Brachial Nerves deſcending through the* Mediaſtinum, *the principal Occaſions of the Conſent of the* Diaphragma *with the Head, and by reaſon of their Commixture with the ſmall Nerves of the Jaws and Lips tending to the Muſcles, the Authors alſo of Sardonic Laughter. To theſe from the lower Part little Nerves joyn themſelves from the Coſtal and Stomachical Nerve paſſing thither.* All theſe Nerves are inſerted near its middle membranous Part, which is not here the Tail, but the Head of this Muſcle, as toward which the Circumference is drawn with the Ribs annex'd.

Its Motion VIII. *In breathing inward, it becomes flat, and from a convex Laxity falls level, but is ſtretch'd out with any ſtreſs; but in fetching the Breath, it is as it were ſtretch'd out with violence, and attracting the Ribs by that ſame diſtention, it begins and ends Expiration with ſome violence; which Ribs preſently following, the Tenſion ceaſes, and a Laxation enſues.* For this Act of Breathing is juſt as we ſee in a Caſting-Net, which is thrown ſpread abroad into the Water; but being drawn up again, is contracted by the inner Ropes of its Circumference. Thus in breathing inward, the *Diaphragma* ſpread abroad in Expiration, contracts its Circumference by its Fibres together with the Ribs annex'd to it, and ſo returns to its looſe Convexity. In like manner as in Ringing, when the Bell goes up, the Rope is upon the full ſtretch, but coming down again, the Rope falls looſe and to ſpare to the ground. But it is not neceſſary that the tenſion or ſtretching of the *Diaphragma* ſhould laſt ſo long as Expiration laſts; for the Ribs being drawn by one forcible violence, preſently follow without any farther violence, and by the gentler contraction of the intercoſtal Muſcles, the *Sacrolumbal* and *Triangular* aſſiſting, are reduced again nearer one to another. Thus any one may try upon himſelf, that the firſt part of Expiration is done with ſome force, the reſt follows more gently without any violence: which is remarkably obſerv'd in deep Sighs, and violent fetching the Breath. From whence it is apparent that the *Diaphragma* is the Primary Muſcle that cauſes Expiration.

John Swammerdam aſſigns to it a Uſe altogether contrary; I ſay *contrary*, nay and impoſſible too. For he writes that the *Diaphragma* by extending itſelf, dilates the Breaſt, and procures Breathing inward, which *Sylvius* alſo inculcates in his *Praxis Medic.* The ſame alſo *John de Bruyn*, a moſt learned Profeſſor of Philoſophy in our Academy, and *John Mayo*, an *Engliſhman*, in his Tract of *Reſpiration*, endeavours in a long Diſcourſe to maintain the ſame thing, when as the Action of all Muſcles whatever, and conſequently of the *Diaphragma*, is the ſame; that is, to contract themſelves, and to bring the Part faſten'd to them, toward their Head, and hence alſo it is impoſſible, that among all the reſt of the Muſcles, the *Diaphragma* only ſhould be able by extending, to dilate both it ſelf, and the Ribs which are faſten'd to it, and that without the aſſiſtance of the other Muſcles ſerving to Inſpiration; for it is a thing unheard of and contrary to the

Nature of Muſculous Fibres, to act by extending. If he meant, that the ſame dilatation of the *Thorax* was caus'd by the contraction of the *Diaphragma*, then he contradicts Reaſon and Experience in ſuch a manner, that no man can excuſe him any longer. For ſeeing that the *Diaphragma* muſt of neceſſity bring the Ribs toward its Head, and the Head of it being the middle membranous Part, and that ſituated in a higher *Medium*, and a more elevated Place, than the Ribs annex'd to it below, of neceſſity while it contracts it ſelf, it muſt bring the lower Ribs inward towards its Head, and ſo muſt ſtreighten, not dilate the Capacity of the Breaſt. Moreover, 'tis another Miſtake of his to think that the *Diaphragma* in the act of drawing in the Breath, drives the Bowels of the *Abdomen* downward, whereas they are mov'd upward, as any one may find in himſelf, and find true in the Diſſections of living Animals. Reaſon alſo teaches us, that in the Act of Breathing inward, the Convexity is reduc'd to a Flatneſs, becauſe the ſides of it together with the Ribs annex'd, are mov'd outward and upwards, and hence alſo the Muſcles and Bowels annex'd to the *Diaphragma*, muſt of neceſſity aſcend upward and outward. Moreover *Swammerdam* himſelf writes, that in Expiration the *Abdomen* is forc'd inward and downward, and therefore in drawing the Breath inward, which is the contrary motion, it heaves upward. Laſtly, he adds; That in Expiration the *Diaphragma* aſcends upward, whereas at that time in the middle, where it adheres to the *Mediaſtinum*, which is annex'd to the *Sternum-Bone* and the *Vertebræ* of the Back, it is mov'd neither upward nor downward, but deſcends every way in compaſs downward, and then returns to its former Oven-like Convexity.

Whether the Situation of it be Natural or Animal.

IX. Riolanus *diſputes whether the Motion of the* Diaphragma *be Natural or Animal; and ſeems to conclude, That the Motion of it is Natural, becauſe it does not depend upon our own Will, and follows the Condition of Reſpiration. But his Opinion is repugnant both to Truth and Experience, as we ſhall ſhew,* Ch. 13. *And ſeeing it is perform'd by the Muſcles of the* Thorax, *of which the greateſt part compoſes the* Diaphragma, *of neceſſity the Motion of the* Diaphragma *is Animal.* In vain alſo does *Riolanus* diſtinguiſh between it free Motion, when it is mov'd of its ſelf; and its violent Motion; when it follows the Motion of other Muſcles: which Motion does not conſiſt in acting alone, but in being able to act. And therefore when the *Diaphragma*, or any other Muſcle ceaſes to act for a time, and for a while follows the Motion of other Muſcles, we muſt not preſently deny the Motion of it to be animal; for it is able to move its ſelf at pleaſure at any time: and if it ceaſe from its Motion, or follow the Motion of other Muſcles, this alſo proceeds from its own Will, becauſe it can do otherwiſe.

CHAP. IV.

Of the Pleura, Mediaſtinum, *and* Thymus, *or Canel-Bone-Kernel.*

The Pleura.

I. THE Pleura *is a Membrane hard, white and ſtrong, ſpred under the Ribs and their Muſcles, and girdling all the inner parts of the* Thorax.

The Names

II. Lindan *over-curiouſly enquires into the Etymology of the Name, and thinks it to be call'd* Pleura *erroneouſly, ſeeing that ἡ πλευρὰ ſignifies a Rib, and not a Membrane; and therefore with* Aretæus *and* Ruffus *he would rather have it call'd the Girding Membrane.*

Its duplicity.

Certainly 'tis a frivolous thing to be ſo nice in Etymologies of this Nature, when we know what the Thing is, and what all Phyſicians for ſo many Ages have meant by the *Pleura-Membrane*. But ſuch Criticks as theſe ſeem more deſirous to know the Bones, than taſte the Kernels.

III. *It is thought to be double*, which Doubling ſeems to be more conſpicuous about the *Vertebræ* of the Back, and in the *Mediaſtinum*. However *Riolanus* denies any ſuch doubling, with whom ſome others agree; becauſe it is not eaſily demonſtrated beyond the *Mediaſtinum*.

On the inſide, where it looks toward the Lungs, it is very ſmooth; but on the outſide, being more rough, it ſticks faſt

fast to the Mid-*Pleura* Muscles, the Ribs, the *Sternon*, and the *Vertebræ* of the Back; but not immediatly to the Bones, but by means of the *Periosteum*, with which those Bones are most neatly cloath'd.

The little Fibres. IV. *Inwards, sometimes in one, sometimes in both sides, it often sends forth from its self nervous diminutive Fibres,* by means whereof many times the Lungs (and that in healthy People) are annex'd to the *Pleura*, without any Inconvenience to Respiration.

Holes. V. *Both above and below it is pervious with several holes, for the Passage of the great Artery, the hollow Vein, the Gullet, and several other Vessels.*

Its Vessels. VI. *It is furnish'd with Arteries, Veins and Nerves from the Intercostals.*

Its Original. VII. *It is said to have its Original from the Bones of the Spine, from which it ascends on each side, through the sides to the* Sternon; *under which the Membrane of each side joins together, dividing the Lungs and the Capacity of the Breast into two parts, and constituting that Fence in the middle of the Breast, which is call'd* Mediastinum; which conjunction of the Membranes of each side is then most conspicuous when the *Sternum* Bone is torn from it.

The Mediastinum.

Its Cavity. VIII. *Between these Membranes, from the Clavicles to the* Pericardium, *some there are who assert a certain Cavity, wherein vicious Humors frequently gather'd together, occasion several Distempers,* believing that Cavity which they made by tearing the Membrane from the *Sternum*-Bone, to have been there before. Which is a perfect Mistake. For that, if you begin the dissection from the hinder part, the Ribs being loosen'd, then you shall find the doubl'd *Pleura* annex'd, without any Cavity between.

Its Vessels. IX. *The* Mediastinum *receives Arteries from the innermost Mammary Arteries, and sends forth Veins to the mammary Veins, and the Vein without a Pair, which are seen upon removing the* Sternum. *Moreover it inserts a Vein call'd the* Mediastin, *into the subclavial Branch of the hollow Vein: which Vein is sometimes single and larger, and sometimes double and slenderer.*

Its Use. X. *The Use of it is to sustain the Heart as it hangs, and to defend it from Injuries, also to divide the Breast and Lungs into two Parts;* that the one being endammag'd or out of order, the other may perform the Office of Respiration, also *to contain the* Diaphragma *upward,* lest the Bowels hanging from it, the Liver and Stomach should draw it too much downward with their weight.

The Kernel under the Canel-Bone or Thymus. XI. *To this same* Mediastinum, *about the Throat in the uppermost part of the Breast, grows the* Thymus, *close joyn'd to the Divisions of the subclavial Arteries and Veins, which is a glandulous, soft, spongy and whitish Body, bigger in Women and moist Bodies, than in Men and dry Bodies.*

This Part in new born Infants is distinguish'd with a small triple Kernel, and seems to have some Affinity of Substance with the Sweet-Bread: in People grown up, the Moisture being consum'd, it is much thinner. *Wharton* saw in an Abortion in the sixth Month, the lower part of the *Thymus* grown to the *Pericardium*, and thence being bifork'd as it was, under the Canel-Bone without the Breast, ascending the sides of the Weazand. So likewise in Calves, it adheres at the lower part to the *Pericardium*; whence it increases into a bigger Bulk, and being divided, leaves the *Thorax* above, and ascending both sides of the Weazand, runs forth to the Maxillary Kernels, and sometimes to the *Parotides*.

Lactes. XII. *And in these Creatures it is very great, call'd* Lactes, *and coveted as a dainty Bit.*

Its Vessels. XIII. *It has also little Arteries and Veins from the Jugulars, so small, that they are hardly to be seen in Dissection.*

Its Juice. XIV. Wharton *allows the* Thymus *Nerves from the sixth Pair, and the subclavial Contexture, which he thinks do empty into this Kernel their nutritive Liquor defil'd with some impurity and extraordinary acrimony, and resume it again when refin'd.* But this is an erroneous Opinion; for *Wharton* takes the Lacteal Vessels to be Nerves, and describes 'em as such: which in these Glandules are never more commodiously to be seen, than by inspection of a Calf newly,

calv'd, and fed with Milk, in the ſame manner with thoſe that are ſcatter'd among the Kernels of Breaſts that give Suck. Moreover *Wharton* does not obſerve what Juice is contain'd in the *Thymus* of a new-born Birth, that is to ſay, whether Chylous or Milky, ſuch as *Harvey* found therein; and *Deuſingius* ſaw plentifully flow out of it; and ſuch as you ſhall find in ſucking Calves kill'd an hour or two after they have ſuckt. Which Juice does not flow thither through the Nerves, but through the Lacteal Veſſels, to be brought to more perfection therein, and ſo to be tranſmitted through the ſubclavial Veins to the Hollow Vein and Heart. But becauſe this Juice in grown People, by reaſon of the narrowneſs of the Lacteal Paſſages tending thither, as being dry'd up, flows in very ſmall quantity, or not at all, into the *Thymus*, hence in ſuch People, that part is very much diminiſh'd and contracted, in like manner as in Womens Breaſts when they grow dry.

Therefore there are no Nerves that are manifeſtly carry'd into the *Thymus*, as being of little uſe to this Part, neither ſenſible nor wanting the Sence of Feeling. Tho perhaps it may permit ſome inviſible Branches of Nerves, to bring about ſome private Effervescency for its own Nouriſhment.

Lymphatic Veſſels.

XV. Wharton *affirms that he has often ſeen Lymphatic Veſſels running through this part, and emptying themſelves into the Subclavial Vein.* Nor do they paſs thither without reaſon; ſeeing that in the preparation of the milky Matter, that *Lympha* is requiſite to raiſe a fermentaceous Effervescency in the Heart.

CHAP. V.

Of the Pericardium and the Humour therein contain'd.

I. THE Pericardium (*as it were thrown about the Heart, which* Hippocrates *calls* Κυλεὸν, *the Sheath or little Capſule of the Heart*) *is a membranous Covering, every way enfolding the Heart, whereby it is contain'd within its Seat, and defended from all external Injuries.*

It is contiguous to the Heart, but ſo far diſtant from it as the Convenience of Pulſe and Agitation requires.

Its Original.

II. *It ariſes at the bottom of the Heart from the common outward Tunicles taken from the* Pleura, *enfolding the Veſſels of the Heart, which being about to enter the Heart, leave it for the forming of the* Pericardium.

Its Membranes.

III. Riolanus *allows it a double Membrane, the outermoſt of which he will have to be deriv'd from the* Mediaſtinum, *but the innermoſt from the Tunicle of the Veſſels of the Heart.* But it would be too great a Difficulty to demonſtrate that Duplicity. Moreover the outermoſt Tunicle of the Veſſels of the Heart is derived from the *Pleura*, as is alſo the Membrane of the *Mediaſtinum*. Beſides that it would be abſurd that from one ſingle *Pleura* two Tunicles ſhould meet together toward the Forming of the *Pericardium*; one from the Tunicle of the Veſſels, and another from the *Mediaſtinum*, and that in the mean time the *Mediaſtinum* ſhould remain a peculiar Membrane. The ſame *Riolanus*, inconſtant to himſelf, writes in his *Animadverſions* upon *Laurentius*, that the *Pericardium* riſes from the *Pleura*, in the doubling of which it is contain'd; and in his *Animadverſions* upon *Bauhin*, That there is not a double, but only one ſingle Tunicle of the *Pericardium*: forgetting perhaps what he had written concerning their duplicity in his *Anthopograph. l.* 3. *c.*7.

Its Connexion.

IV. *The outermoſt part is ty'd to the* Mediaſtinum *with ſeveral little Fibres, and appears conjoin'd, and continuous to it about the bottom of the Heart, where it gives way for the greater Arteries and Veins to paſs through. The lower part of it ſticks to the Center of the* Diaphragma.

Its Veſſels.

V. *For Nouriſhment it has ſuch ſlender Arteries, that they can hardly be diſcern'd. It ſends forth little Veins to the Phrenic and Axillary Veins. It alſo admits diminutive Nerves from the left Branch that turns back, and the Sixth Pair paſſing to the Heart.*

The Liquor of the Pericardium.

VI. *It contains within it a ſerous Liquor,*

Liquor, ruddy in Bodies naturally conſtituted, bred from the Vapours ſent from the Heart, and ſomewhat condens'd in the Pericardium, *to the quantity of one or two Spoonfuls.* This is the true Cauſe of its Generation; and therefore they are not to be heeded, who think it to be produced from Drink, Spittle, Fat of the Heart, or any other Cauſes. *Nicholas Stenonis* however believes it to be emptied out of certain Lymphatic Veſſels into the *Peritonæum.*

Its uſe. VII. *This Liquor moiſtning the Heart withoutſide, and rendring it ſlippery, makes its Motion alſo more eaſy, and prevents overmuch Drineſs.* But the long want of it cauſes Drineſs, and many times a Conſumption. The want of it proceeds, when through ſome Wound of the *Pericardium*, Exulceration, or ſome other Solution of Continuity that ſame Sweat of the Heart condens'd therein, flows out of it, and cannot be contain'd therein. Yet ſome Practitioners have obſerv'd then, when it has flow'd out through ſome Wound of the *Pericardium*, that Wound being cur'd, it has bred again, and the Patients have recovered their Health. Of which we have many Examples alledged by *Galen*, *Cardan*, *Beniverius*, *Peter Salius*, and others.

This Liquor is found as well in the Living as Deceas'd, as appears by the Diſſection of living Creatures; which clearly convinces *Matthew Curtius*, who will not allow it in living Animals.

What ſuch it is in diſeaſed Bodies. VIII. *In diſeaſed Bodies we have found it of a more watry Colour, ſometimes like Urine, at other times like troubled Water, but much more in Quantity.* For I have met with many Anatomies in our Hoſpital, in which I have found half a Pint of this Liquor at a time. In the Year 1651. in the Body of an *Engliſh* Man that had long fed upon ill Diet, and ſo falling into a Flegmatic *Cachexy*, at length died, we ſhew'd to the Spectators at leaſt two Pints contain'd in a diſtended and very much looſen'd *Pericardium*, which was obſerv'd by ſeveral as an unuſual Accident.

The cauſe of the difference in Quantity. This liquor I always found to be leſs in Quantity, and more ruddy in Men of a hot Temper, in whom the Vapors exhaling from the Heart are more thin, and but a ſmall Quantity condens'd in the *Pericardium*, and ſuch as were condens'd were ſooner attenuated by the violent Heat of the Heart; and ſooner exhale through the Pores of the *Pericardium.* On the other ſide I obſerv'd it more watery, more plentiful, and pale in colder Complexions, in whom through ill Diet, a diſeaſed Conſtitution, or ſome other Cauſes, their Heat was leſs ſtrenuous. For which reaſon thicker Vapors ſent from the Subſtance of the Heart, and collected and condens'd in greater Quantity in the *Pericardium*, were not ſo ſoon diſſipated for want of ſufficient Heat. Hence. *Veſalius* affirms it to be more plentiful in Women than in Men: And *Riolanus* obſerv'd it more plentiful in old Men than in young Men.

The plenty of it does not cauſe Palpitation of the Heart. X. Moreover we obſerv'd that a greater Quantity of this Liquor does not cauſe the Palpitation of the Heart; which is generally aſſerted however by moſt Phyſicians, from *Galen*'s Opinion. For in all thoſe, in whom after they were dead I found a greater quantity of this Liquor in the *Pericardium*, during all the time of their Sickneſs I obſerv'd no Palpitation of the Heart at all, not ſo much as in the *Engliſhman* before mentioned, but on the other ſide, a languid and weak Pulſe. Neither does the Plenty of that Liquor cauſe ſuch a Narrowneſs of the *Pericardium*, as is vulgarly believed, that the Heart cannot move freely within it, and therefore palpitates. But on the other ſide we always found, that the *Pericardium* was thereby rendered ſo broad and looſe, that the Heart might move more freely therein, than in leſſer Liquor. So that the Plenty of this Liquor does not cauſe Palpitation, which is rather excited by any Liquor tho but ſmall, which contrary to Cuſtom ſuddenly and violently dilates, or by its Acrimony, Corruption, or griping Quality moleſts the Heart, and ſtirs it up to expel ſo troubleſom an Enemy.

CHAP. VI.

Of the Heart in General. See Table 9.

The Names. I. COR, *the Heart, ſeems to take its Name from* Currere *to run; for which reaſon the* Belgians *call it* Hart, *or* Hert, *that ſignifies alſo*

a Hart *or* Stag: *because as that Beast excels all others in Swiftness and Motion, so does the* Heart *surpass all other parts of the Body in the same Qualities. Which* Belgic *word nevertheless seems to be deriv'd from* Harden, *which signifies* Duration, *or from* Hard, *which signifies* Hardness, *either because its Motion lasts all a Mans Life-time; or else because it exceeds the Muscles, and other* Parenchyma's *in hardness of Substance. Riolanus* deduces the word *Cor* from the Greek Κῆρ, contracted of Κέαρ, from Κέω to burn, because from thence the Fire of our Body proceeds. And so the *Belgic Hert*, may be deriv'd from *Heert*, which signifies a *Hearth*. *Menetius* derives it from Καρδαίνω, to *Shake*, or *Brandish*. *Chrysippus* deduces it from Καρδία or Καρδὸς signifying *Strength*, or from Καρέω to be strong in Empire, because it performs most strenuous Actions, and governs all the other parts of the Body.

It is a principal Part. II. *However it is the Principal of all the Bowels, the Sun of the Microcosm, the Principle of the Actions of Life, the Fountain of Heat and Vital Spirit, and the Primum mobile of our Body.* Which being vigorous and active, all the natural Functions of the Body continue in a vigorous and flourishing Condition; when that languishes, they languish; and when that fails, they cease altogether. For in this is contain'd the Fuel and Flame of natural Heat; while all those parts of the Body grow stiff and numm'd with Cold, to which the Blood is hindred from coming from the Heart; and that Blood grows cold that is absent longest from this Fountain of Heat, and the wast of natural Heat can be repair'd in no other part of the Body than in this. All which things are confirm'd by the Testimony of the Sences, for that if you put a Finger into the Heart of a dissected living Creature, so extraordinary a Heat is felt therein, as the like is not to be felt in any other part of the Body.

The Fuel of Heat. III. *This Heat, tho so excelling from the Principle of Heat it self, as it is, and tho it be implanted and fixed within it; yet certain it is, that it is maintained and augmented by the Humours infused into its Ventricles, and there fermenting, and is continually fed by that continual Fermentation or Effervescency of Humours discharged into it.* Lime-stone burns through the mixture of Water, by reason of its Fermentation or Effervescency; what wonder then if the Heat of the Heart be presently inflam'd by the Fermentation of Humours flowing into it? and that Flame should be more or less according to the greater or lesser fermentaceous Effervescency, which greatly depends upon the aptitude of the Matter to be fermented? For the innate hot Spirits of the Heart, act upon the Matter that flows in, and ferment it with its Heat, and cause it to boyl, and so renew the Flame that would extinguish by degrees, till it went quite out.

Its Situation. IV. *It is seated in the middle of the Breast, surrounded with the* Pericardium *and* Mediastinum, *somewhat reflexed with the Point toward the left, by reason of the* Diaphragma, *and fasten'd to it in none of the adjoyning parts, but hanging only from the Vessels going in and out at the bottom, to which it is united.* But its Pulsation is felt most in the left side, below the Pap, because the Sinister Ventricle arises toward the fore-parts of the *Thorax* with the *Aorta*, which both together strike the left side. But the Right Ventricle lies deeply seated toward the right side, and therefore its Pulsation is less felt without upon the right side. It is very rare that the Heart changes this Situation, and that the right Ventricle lies in the left side, and the left Ventricle in the right Side, and beats in this. Yet *Riolanus* affirms he obsery'd this Situation in a Man of forty Years of Age, and in the Queen Mother of *Lewis* the XIII.

Its Substance. V. *The Substance of it is firm, thick, compact; some thinner and softer in the right side, thicker and more compacted in the left side; closer and harder at the Point: Yet at the end of the point where the left Ventricle ends, thinner, as consisting of the Concourse of the inner and outer Membrane.*

Its Fibres. VI. *This Substance* Galen *affirms to be interwoven with a threefold sort of Fibres, whom most Anatomists follow.* But if the Fibres of the Heart be diligently considered, and sunder'd by degrees (which may be done as well in a boyl'd Heart, as in one newly

ly taken out) there are no tranſverſe Fibres to be found, whatever *Veſalius* has imagin'd, but they ſeem all to be wound about with a periwincle Chanel, that is ſomewhat bowing and arch'd about the middle; yet they do not all reach the Point neither, but are turn'd upward with their Extremities. For thoſe which firſt deſcend from the Orifices of the Ventricles are ſhorter, next to which are others ſomewhat longer, yet not reaching to a Cone. To theſe are joyn'd others ſomewhat longer: So that at length, the laſt, which are the longeſt, reach to a Cone, and contain the reſt which are ſhorter and plac'd under them, and annexed to them. And becauſe the ſhorter contain'd under the longer make the Heap the higher, it comes to paſs that the upper and middle part of the Heart is ſomewhat more bunchy, when the longer, to whoſe Extremities the ſhorter cannot reach, end in a ſharper Cone. Nevertheleſs according to the Obſervation of *Nicholas Steno*, this ſame Courſe of the Fibres ſeems rather to be obſerved in the Region of the right than left Ventricle. He obſerv'd this Courſe in the right Ventricle to aſcend the Fibres obliquely deſcending inwardly from the *Septum* toward the hinder Parts along the exterior *Superficies*, and ſo to elevate a little the bottom of the right Ventricle toward the *Baſis*; and hence it happens that in Contraction, the Heart in the right ſide comes to be not only ſhorter, but ſometimes rounder and thicker, and by reaſon of this greater ſhortneſs and thickneſs of the right and left ſide of the Walls, of neceſſity the Hollowneſs of the Ventricles become narrower.

Whether the Heart be a Muſcle.

VII. ***By reaſon of theſe Fibres, and the Motion of Pulſation,*** Hippocrates ***aſſerted the Heart to be a Muſcle; which has hitherto been ſtifly deny'd by all the Schools of Phyſicians who have generally aſſerted that it is the Chief Bowel in the Body.***

1. Becauſe therein is generated the moſt noble Humour together with its Spirit; *viz.* The ſpirituous Vital Blood; whereas there is no particular Humour or Spirit generated in any Muſcle.

2. Becauſe in hardneſs of Subſtance it exceeds the Subſtance of all Muſcles.

3. Becauſe fleſhy Fibres do not make a Muſcle; for otherwiſe the Stomach and the Piſs-bladder, by reaſon of their fleſhy Fibres might eaſily be reckon'd into the number of Muſcles: From which they are nevertheleſs exempted by common Conſent.

4. Becauſe the Heart has Ventricles and Valves, which are not to be found in any Muſcle of the whole Body.

5. Becauſe the Muſcles are the Inſtruments of voluntary Motion, which are mov'd at Pleaſure and not perpetually but by Intervals, and are tir'd by long and vehement Motion; and ſo compell'd to deſiſt from Motion. Where on the contrary the Heart is mov'd not with an animal, but with a natural unwearied Motion, which cannot be alter'd, increas'd, leſſen'd or ſtopt at pleaſure; but continues from the beginning to the end of a Man's Life.

Now tho theſe be very ſtrong Arguments, nevertheleſs *Nicholas Steno* goes on, and pronounces that the Heart is nothing elſe but a Muſcle, becauſe it has all thoſe things that are allow'd to a Muſcle, neither is there any thing found in the Heart which is deny'd a Muſcle; and hence excuſes it from the duty of ſanguifying and generating natural Spirits, and laies it up among the ſervile Muſcles, deſpoyl'd of all the Privileges hitherto allow'd it, perhaps intending to write its Elegy in a ſhort time, with the ſame Applauſe as *Bartholine* makes his Epitaph upon the Liver; as if I ſhould ſay, becauſe the Piſs-bladder has all thoſe things which are allow'd the Stomach, as Membranes, Nerves, Arteries, and Veins, and a globous and hollow Form, therefore the Bladder is the Stomach, and appointed for the ſame Uſes.

Its Figure.

VIII. ***The Heart reſembles a Pyramid with the ſharp end turn'd downward, or broad above and pointed below.*** To which purpoſe it is divided into the Baſe, or upper part, and the Cone or ſharp part, which terminates below in a Point.

Its Bigneſs.

IX. ***The Bigneſs of it varies according to Age and Temper.*** Yet conſidering the Bulk of Body, it is bigger in Men, than in any other Creatures. The ordinary length of it in Perſons grown to ripe years, is about the depth of ſix Fingers, and four Fingers broad. It is alſo obſerv'd that in men of hot Conſtitutions, and Couragious, it is leſſer and harder, but in cold Conſtitutions, and Men that are timid, it is bigger and ſofter. In like manner in all other timorous and ſlothful Creatures, according to the Proportion of the Body it is very large; but in ſuch

as

as are bold and daring, ſmall or of a moderate bigneſs. *Bauſchius* however produces ſome Examples of Lyons diſſected, whoſe Hearts according to the proportion of the Bodies of thoſe Creatures, were much larger than in any other Creature. Sometimes, but very rarely, there has been obſerved a wonderful Exceſs of the Heart in bigneſs. And ſo that Man had a monſtrous Heart, which *Dominic de Marchetti* aſſerts to have diſſected at *Padua*; which was of ſo vaſt a Magnitude, that the Lungs being very ſmall, it poſſeſs'd the whole Concavity of the Breaſt, and depreſs'd the *Diaphragma*, having the *Pericardium* joyn'd to the *Pleura* at the ſides, and its Ventricles ſo large, that they were able to contain the ordinary Heart of any other Man. No leſs monſtrous was that of which *Kerkringius* writes, that being diſſected out of a Woman of forty years of age, weighed two and twenty Ounces, and whoſe right Ear only equalled an ordinary Heart of a Man. The Pulmonary Artery alſo, and the hollow Vein, were of an extraordinary Bigneſs. Many other Examples of Hearts of an extraordinary Bigneſs *Bartholinus* ſets down in his Obſervations, as having been ſeen by himſelf.

Its Coats. X. ***It is wrapt about on the ſide with a proper and thin, but ſtrong and compact Tunicle***, and hardly ſeparable from it, for the Security of the Bowel; and ſuch a Tunicle as this, is that ſame thin proper exterior Tunicle of the great Arteries: And as the thin Pellicle on the inſide enfolding the Ventricles is continuous and common with that ſame thin Pellicle, which like a ſmooth little Skin enfolds the greater Arteries on the inſide; hence it is very likely, that the Arteries borrow theſe Tunicles from the Heart, as the Nerves borrow two Tunicles from the *Meninges* of the Brain.

Its Fat. XI. ***To this exterior Tunicle, about the bottom grows a hard ſort of Fat***, on purpoſe to moiſten it, which *Riolanus* has obſerved to be more copious and yellower in Women than in Men. This Fat has been ſeen ſo abounding round about the Heart in Beaſts, that formerly the Southſayers have been often deceiv'd thereby, and have thought the Beaſts had no Hearts. Thus *Spigelius* writes, that in an Eagle diſſected at *Padua*, he found the Heart ſurrounded with ſuch a quantity of Fat, that he could eaſily have perſwaded many that were preſent that the Bird had no Heart.

Its Hairs. XII. It is a very rare thing to find the Heart Hairy; which however has been obſerv'd in ſome Hearts. As in that of *Hermogenes* the Rhetorician, by the Report of *Cælius Rodiginus*. And in *Leodina* and *Liſander* the *Lacedæmonian*, by the Teſtimony of *Plutarch*. Alſo in *Ariſtomenes* of *Meſſina*, as *Valerius Maximus* witneſſes. Of modern Authors *Beniverius*, *Amatus* of *Portugal*, and *Moretus* affirm that they have obſerved hairy Hearts.

Its Veſſels. XIII. Through the outward parts of the *Parenchyma* are ſcattered ſeveral Veſſels call'd Coronary, becauſe they encircle the bottom of the Heart like a Crown, and are both Arteries and Veins.

Coronary Arteries. XIV. ***There are two*** Coronary Arteries, ***ariſing from the beginning of the*** Aorta, before it goes forth from the *Pericardium*, which ſome think is furniſhed with a little Valve at its firſt riſe, to hinder the return of the Blood. Theſe Arteries encompaſs the Heart, and extend many little Branches from the Baſis to the Cone, of which the moſt and largeſt are conſpicuous in the left ſide. Their Uſe is to convey the ſpirituous Blood immediately iſſuing out of the left Ventricle, for the Nouriſhment of the *Parenchyma*. *Harvey* believes that the Heart, by means of them, together with the Blood, receives both Heat and Life. Which Opinion *Riolanus* derides, who aſſerts it to be abſurd for the Heart to receive Life and Heat from that Blood, ſince the Heart it ſelf is the Fountain of Life and Heat, from whence ariſes the heat of that Blood, and hence concludes, that the outward parts of the Heart are only nouriſhed by theſe *Coronary Arteries*, and the Fat preſerv'd. To which he might have added that the Heart makes the Blood and cauſes it to be, and lives and is mov'd before there is any Blood.

Coronary Veins. XV. ***The*** Coronary Veins ***alſo are two***; Which like the *Coronary Arteries* encircle the Heart, and are inſerted into the hollow Vein, and empty the Blood which remains after Nouriſhment, and out of many leſſer little Branches aſcending from the Cone to the Baſe into the hollow Vein. To theſe, tho' very erroneouſly, *Bauhinus*, and *Spigelius* allow a Valve, by which they believe the Influx of the Blood out of the *Coronary* into the hollow Vein is prevented. Whereas of neceſſity that

Influx

Influx ought to be uninterrupted and free, and if there be any little Valve there, it ought to be plac'd after such a manner, as to hinder the Influx of the Blood out of the hollow into the Coronary Vein, in regard that to the same purpose there is a little Valve annex'd to the emulgent Jugular, and several other Veins which open into the hollow Vein.

Nerves. XVI. Besides the Coronary Vessels, *Galen* asserts, That the Heart also receives small and invisible diminutive Nerves from the sixth conjugation or joyning together of the Nerves: but as *Riolanus* observes, it receives them from the fold of the stomachic nerves existing at the *Basis* of the *Heart* toward the Spine. Of these Nerves of the *Heart* *Picolomini*, *Sylvius*, *Bauhinus*, *Bartholin*, and others make mention. And Dissection teaches us, that they are difficultly to be found, and not to be discern'd within the Substance it self of the *Heart*: and this *Fallopius* testifies, in these Words; *Under the Basis of the Heart*, says he, *where the Arterial Vein begins to turn to the left side, and where that remarkable Arterial Passage in the* Embryo *is, which joyns the said Vein with the* Aorta, *is a certain Fold, or Nervous Complication, strong and solid, from whence a great quantity of Nervous Matter embraces the whole Basis of the Heart, through which several Branches of little Nerves thence produc'd are scatter'd, and run through its whole Substance* (which he adds by conjecture) *though I cannot follow them exactly and particularly with my eye.*

Thus *Galen* could not exactly discern the insertion of the Nerves into the Substance. *Only*, saith he, *its covering the* Pericardium, *seems to receive the Branches of slender Nerves, from which being divided, other conspicuous Branches, at least in Animals of larger Bulk, seem to be inserted into the Heart it self: but they are divided into the Substance, that cannot be perspicuously discover'd by the Senses.*

These Nerves by reason of their extraordinary slenderness, are so extraordinarily imperceptible, that it was question'd by many, and even by my self formerly, whether any little Nerves or no did enter the *Heart*. However at length, after a more diligent Search, I found several diminutive Nerves, like small Threads, extended from the Fold to the *Basis* of the *Heart*, and the Orifices of the Ventricles, in the same manner as *Fallopius* discovers them, which I found a most difficult thing to follow into the Substance it self of the *Heart*; for that being scatter'd in the *Basis* it self, and the exterior Tunicle, they seem'd presently to disappear, and only two somewhat of the larger size, seem'd to enter the substance of the *Parenchyma*: whence I thought it probable, if any Branches ran any farther, that they are only extended like thin and invisible Threads into the substance, and bequeath it a kind of dull sense of Feeling. *Fallopius* attributes to the *Heart* a most acute sense of Feeling, but contrary to experience: For its dull sense of Feeling is sufficiently apparent in every strong Pulse, which is not felt either in or by the *Heart*. Nay not in that same sick person mention'd by *Fernelius*, who consum'd away insensibly, in whose *Heart*, after he was dead, he found three Ulcers, and not a little hollow, and full of Matter, contracted long before; which must have occasion'd a most sharp pain in so sensible a Part: of which nevertheless *Fernelius* makes no mention (nor *Dominic de Marchettis*, in a Patient of the same Nature) without doubt because the Patient never complain'd of any pain. And the same Experiment is added of a Person wounded in the *Heart*, whom we saw our selves, who nevertheless complain'd of no pain in his *Heart*.

Here perhaps it may be objected, That the Inconvenience of Palpitation is sufficiently felt. To which I answer, That it is not felt in the Heart, but in the *Pericardium*, the *Mediastinum*, the middle of the *Diaphragm*, and other adjoining Parts, which being of quick sense of feeling, are soon and violently pain'd by a strong motion of the Heart putting a force upon them. But what shall we say, when fetulent Vapors carry'd from the Womb and other Parts to the Heart, put it to great Pain, does not that Pain proceed from its acute sense of feeling? I answer, if the Heart felt any twinging vellication, it would complain; but it does not complain: therefore. Whence I infer, That tho' we allow a kind of dull sense of feeling to the Heart, especially in its outward Tunicle, and the Orifices of the Ventricles; nevertheless we must believe, that these Alterations and Pains whatever they are, especially the sharper sort, chiefly proceed from hence, either because the Heart has but a dull sense of feeling, or else, 1. Because that the Blood which ought to be dilated in the Heart, is thicken'd, coagulated, or o-

therwiſe deprav'd by thoſe corrupt and vicious Vapors and Humors, ſo that it cannot be dilated as it ought, or is uſual for it to be in the Heart; whence proceeds its faſter or ſlower, diſorderly or otherwiſe diſcompos'd Motion. 2. Becauſe the innate Spirit of the Heart, the principal Cauſe of Motion, is overmuch coagulated, refrigerated or diſſipated by thoſe Humors. 3. Becauſe other more ſenſible Parts being pain'd and tormented by thoſe vicious Humors, are very much agitated, contracted and looſen'd; and for that reaſon they force the Blood from themſelves toward the Heart after an unuſual manner, whence it happens that the Blood is attenuated alſo in the Heart after an unuſual manner, ſo that the Pulſe being alter'd, it is not ſent conveniently to the Brain, by which means it happens that the Animal Spirits are generated out of order, and ſent out of Order to the Nerves.

The Opinion of Deſcartes.

Deſcartes obſerving no remarkable or apparently manifeſt Nerves to be extended into the Subſtance it ſelf of the Heart, was unwilling confidently to aſſert it, but in the mean time, that he might the better explain the Paſſions of the Mind, affirms with *Fallopius*, that there are certain diminutive Nerves which reach to the Orifices of the Ventricles of the Heart: for he ſays that there are particularly to be obſerv'd certain Nerves inſerted into the *Baſis* of the Heart, which ſerve to dilate and contract the Orifices of its Concavities; and upon this foundation he rear'd his Learn'd Treatiſe of the Paſſions of the Mind.

The Uſe of the Animal Spirits in the Heart.

XVII. *Theſe Animal Spirits therefore*, as has been ſaid, *contribute a certain faint ſenſe of feeling to the Heart*; for it ought not to have a quick ſenſe, leſt it ſhould be diſturb'd and moleſted by its continual motion, and the Paſſage and Fermentation of ſharp and corroding Humors. *Beſides, the Parts being altogether compleated, they contribute alſo a kind of fermentative power to the Nouriſhment of the Heart*, of which, at the beginning, it had no need, becauſe the ſharp particles of the ingendring Seed collected together in the formation of the Heart, contain in themſelves a ſufficiently ſharp fermenting quality, proportionable to the tenderneſs of the Matter wherein they operate. But afterwards when the Bulk of the Heart enlarging it ſelf there is in need of ſtronger Matter, than there is requir'd the aſſiſtance of Spirits ſomewhat more fermentative. Laſtly, *Theſe Spirits looſen or contract the Orifices of the Heart, or its Ventricles*; by which means there happens a freer Ingreſs and Egreſs of the Blood to the Heart, in the Paſſions of the Mind; and hence at the ſame time proceed alterations of the Blood. Hence in Fear, Palpitations of the Heart, in Grief, Contractions with a ſmall Pulſe, in Joy, a grateful and pleaſing heat about the Heart, with a ſwift and ſtrong Pulſe.

The Dignity of the Heart.

XVIII. *The Heart then is the principal and ſovereign Bowel from which is diffus'd the vital Liquor, with perpetual heat, the ſupport of Life, to all Parts of the Body*: of which when any of the Parts are never ſo little depriv'd, they fall and die. And therefore the Diſtempers that befal it, are chiefly dangerous, and the Wounds of it altogether mortal, as *Hippocrates* pronounc'd; ſo that although ſome being wounded in the Heart, have lived for a time, yet they could never be cur'd. Nay, for the moſt part, ſo ſoon as the Wound enters the Ventricles, they fall like men Thunder-ſtruck, which I have ſeen three or four times with my own Eyes; ſo that I have often ſtood in admiration, how a man could be ſo ſoon depriv'd of all Life, Senſe and Motion. Nevertheleſs the Reaſon is plain; for that the Blood which ought to be forc'd into the Great Artery, and through that to the Brain and all other Parts, by reaſon of the Wound, is pour'd forth into the Concavity of the Breaſt. So that no Blood being carry'd to the Brain, preſently the motion of the Animal Spirits ceaſes in the Brain, nor are they any longer convey'd through the Nerves to the ſeveral parts. Hence alſo there happens a Ceſſation of the principal Faculties and Senſes; and of all motion of the Muſcles, and among the reſt of the Reſpiratory; which occaſions the ſuddenneſs of the Death. But if a ſmall Wound do not penetrate into the Ventricles, then ſometimes, but very ſeldom, it happens that a man does not fall preſently, but lives for ſome hours. Thus *Parœus* ſaw a man wounded in the Heart, that ran above two hundred Paces. *Schenkius* alſo makes mention of a Student, who having receiv'd a Wound through both his Ventricles, yet ran the length of a whole Street, and was in perfect ſenſe of Mind for an Hour. *Sennertus*, *Johnſon*, *Muller*, *Heers* and *Tulpius* produce ſeveral Examples of men that have liv'd after they

Wounds of the Heart mortal.

they were wounded in the Heart for several hours; nay for one or two days. Says *Fernelius*, *Wounds in the Heart, which do not penetrate far into the Ventricles, do not presently kill; In a certain Person, who linger'd and consum'd away by degrees, and at length dy'd, I found three Ulcers in his Heart, hollow and foul, and long before contracted.*

Somewhat like this, concerning an Ulcer in the Heart, *Dominic Marchettis* relates, of a man who having been consuming a long time, dy'd: in the dissection of which person, he found a great Ulcer, which had eaten out not only the *Capsula* of the Heart, but also a great part of its Substance, till it had penetrated into the Cavity of the left Ventricle, and then kill'd the man. But it is more wonderful that a great Wound in the Heart should be cur'd. Of which *Cabrolius* saw a President in the Dissection of a human Carcass in the Anatomical Theater. For he says he found in the Heart of a Thief that was hang'd, the remaining Scar of a Wound that had been cur'd, about two Fingers long, and about the thickness of a Sixpeace. But though such Accidents are rare, nevertheless I never remember that ever I read so extraordinary an Example of a Heart wounded, as what I saw with my Eyes, a Story so remarkable that I thought fit to insert it in this place.

A rare Observation. In the Year 1660. *April* 5. I was sent for to *Culenburgh* together with some other *Physicians* and *Surgeons*, at the Request of the Magistracy of that Town, to view the Body of a Young Man, of about twenty years of Age, and very strong when he was alive, wounded with a Sword, and dying of his Wound; to the end we might give our Judgments whether he dy'd of his Wound, or by any other Disaster. Upon opening the Body my self, first we were inform'd that the young man after he had receiv'd the Wound, walk'd about fifty or sixty paces, and then fell down, and then falling into a Convulsion, was carry'd home, and in a little time after, came to himself again. The Physicians and Surgeons who then lookt after him, affirm'd, that the first and second day very little Blood issu'd forth from his Wound, which was very narrow; but that afterwards, the Wound being somewhat dilated, such a quantity of Blood gush'd forth, that they were forc'd to stop the Flux of Blood by tying of his Body in several places. They added, That the Patient was all along very sensible, and never complain'd in the least of any inward pain, mov'd his Body of himself, and when he was ty'd, turn'd upon his side of his own accord, and cough'd freely to promote the efflux of Blood out of his Wound; that he eat and drank something every day, till at last his Strength failing, he dy'd, having liv'd nine days and eight hours after he had receiv'd his Wound.

Having heard this Relation, I went on to view the Body, and shew'd the Wound that was given him between the fifth and sixth Rib of the Right Side, about a Thumb's breadth before the Ribs run into Gristles. Removing the *Sternum*-Bone, I found the Cavity of the Breast upon the wounded Side, to the *Mediastinum*, fill'd with Blood; which being dry'd up with a Spunge, I perceiv'd where the Sword had gone in, without touching the Lungs, at the Heart, under the *Sternum* through the *Mediastinum* and *Pericardium*, and had penetrated directly into the upper part of the right Ventricle of the Heart, between the treble pointed little Valves, near the entrance of the hollow Vein, and had gone no farther: the *Pericardium* also was full and distended with coagulated Blood. It will seem a wonder to many how this man after such a Wound could live so many days and hours: however, I believe the Reason was this, because the Wound was very narrow, and in the upper part between the little Valves; so that in the contraction of the Heart, all the Blood which flow'd out of the hollow Vein into the right Ventricle, by reason of the obstruction of the Treble-pointed Valves, could not be forc'd out of the Wound, but that the greatest part of it was forc'd into the Lungs through the pulmonary Artery, which was much wider than the Wound, and from thence to the Left Ventricle and the *Aorta*-Artery, so that but a very little at a time could be forc'd by the several Pulses out of the Wound into the *Pericardium* and Cavity of the Breast, which was the Reason it was so long before his Strength fail'd him.

CHAP. VII.

Of the Motion of the Heart.

I Have ſaid in the preceding Chapter, that the *Heart* is the principal and perpetual *Mobile* of our Body, from whence proceeds all the Natural Motion of the whole Boyd, and perpetually laſts ſo long as the Motion of the *Heart* laſts. But the Reaſon of its perpetual Motion is not ſo perſpicuous; which is the Reaſon that Opinions vary concerning it.

I. *Some ſay, That the Heart is mov'd by the Animal Spirits.*

II. *Others believe that the Heart is mov'd by the dilatation of the Blood in the Ventricles of the Heart.*

III. *Others are of Opinion, That it is mov'd partly by the dilatation of the Blood, and partly by the influx of Animal Spirits.*

IV. *Others ſay, That it is mov'd by a Subtle or Ethereal Matter.*

V. *Others hold, That it is mov'd by ſome certain Spirit in the Blood.*

VI. *Some aſſert, That the Heart is mov'd by the Reſpiration of the Lungs.*

1. Whether the Heart is mov'd by the Animal Spirits.

1. The firſt Opinion produces Three very ſpecious Reaſons for its Support. *Firſt*, Becauſe that in our Bodies all apparent and violent Motions are made by the influx of the Animal Spirits, and that therefore the Motion of the *Heart* muſt proceed from the ſame Influx. *Secondly*, Becauſe the ſeveral little Nerves are not in vain inſerted into the *Baſis* of the *Heart:* but rather to that end that they may convey the Animal Spirits to accompliſh its Motion. *Thirdly*, For that it is manifeſt in the Paſſions of the Mind, that the *Heart* is more or leſs mov'd by the greater or leſſer Influx of thoſe Spirits.

But though theſe Arguments are propounded with ſome appearance of Probability, yet that this Opinion is far from Truth, ſeveral Reaſons make manifeſt.

1. Becauſe thoſe Motions that proceed from the influx of Animal Spirits, are arbitrary, eſpecially in the Muſcles, of which number they aſſert the *Heart* to be; but the Motion of the *Heart* is not arbitrary, ſeeing it is not perform'd, nor can be perform'd or alter'd at our pleaſure.

2. Becauſe the *Heart* beats in a Hen-Egg, or other Conception, before the Brain is perfected, and begets Animal Spirits; or before any Animal Faculty is produc'd into Acts of moving and feeling.

3. Becauſe the Nerves of the *Heart* are ſo ſmall and ſlender, that they cannot contribute a ſufficient quantity of animal Spirits to perfect that ſame durable Motion. For to all the moving Parts are allow'd Nerves according to the ſwiftneſs or diuturnity of the Motion. The Eye that ſees, and is mov'd all the Day, and reſts all the Night, beſides the viſual Nerve, has another large moving Nerve. So the Muſcles of the Legs and Arms, as they cauſe ſwifter or ſlower Motions, have greater or leſſer Nerves; which happens alſo in all the other parts. Seeing then that all the other moving parts, which reſt much longer than they are mov'd, require large and conſpicuous Nerves, ſhall the *Heart* that moves with a continual motion day and night, all a man's Life long, and therefore requires a far larger quantity of Spirits, than any other part that is mov'd? is it poſſible, I ſay, that the *Heart* ſhould be furniſh'd with a ſufficient quantity of Spirits to maintain that continual Motion by the means of ſuch ſlender and almoſt inviſible Nerves? Beſides, that it is as yet uncertain whether thoſe diminutive Nerves, whoſe productions are ſeen to extend themſelves to the *Baſis* of the *Heart*, the *Pericardium*, the Orifices of the Ventricles, and the external Tunicle, enter any farther into the ſubſtance it ſelf of *Parenchyma*: many indeed aſſert it, but no body demonſtrates it. *Galen* and *Des Cartes* very much ſcruple it; and ſo does *Thomas Willis*, an exact Searcher into the Brain and Nerves, to whoſe Induſtry in that Particular we are very much beholding; who dares not aſſert any ſuch thing poſitively, but ſays, That *more Branches of Nerves and Fibres are diſtributed into the little Ears of the Heart and Veſſels appendent, than into the Subſtance of it.* We ſay that very few Nerves enter the Subſtance it ſelf of the *Heart*, and that they are ſo ſmall and few, that cannot afford or convey ſufficient Animal Spirits to perpetuate the Motion of the *Heart*, but only contribute ſome few which aſſiſt to the Nutrition of the *Heart*.

4. Be-

4. Becauſe that to cauſe Motion there is required a great Quantity of Animal Spirits, but that for the Sence of Feeling a very few ſuffice: And therefore all the Parts that are apt to feel, which receive many Spirits to perfect their Motion, have alſo a moſt accurate Sence of Feeling: But thoſe which receive but few Spirits, they are not mov'd at all, and have but a dull ſence of Feeling, as is apparent in Palſies of the leſſer Degree. Nevertheleſs, That the Heart has Membranes proper for the Sence of Feeling, as the outward and inward enfolding Tunicle, treble pointed and miter-like Valves and proper Fibres, and yet is endu'd but with a dull Sence of Feeling, is manifeſt from what has been ſaid in the preceding Chapter; and thence it is apparent, that it receives but few Animal Spirits: Which if it did admit in ſo great abundance, as to accompliſh its perpetual Motion, they would without all Queſtion occaſion a moſt acute Sence of Feeling therein.

5. Becauſe the Hearts of ſeveral Animals, as Frogs, Serpents, Eels, *&c.* being pull'd out of their Bodies, will beat a long time after, whereas all the Parts about it being cut away, as alſo all the neighbouring Nerves, there can be no Influx of Animal Spirits into them. To this purpoſe take a living Dog, and having ſlit him all along from the Throat, take both Trunks of the *Wandring Pair*, through which the Spirits flow to the Heart, and either tie it hard, or cut it off, the Creature indeed will become ſilent and ſtiff, but the Pulſation or Motion of the Heart will not fail for all that; nay he ſhall live ſo long, till his Strength failing by degrees for want of Food, he is famiſhed to Death: For he refuſes Meat, in regard there are no Animal Spirits which can come to the Stomach and increaſe Hunger.

6. Becauſe that ſeeing the Heart is form'd and perfected before the Warehouſe of the Animal Spirits, the Brain, and proves conſpicuous, beats, and is mov'd before any the leaſt Foundations of the Brain at any time appear, as is apparent in an Egg ſet under a Hen, or any other Conception. If you ſay that nevertheleſs in the Egg or Bubble certain Delineaments of the Brain are in being, tho' not to be diſcern'd by the Eye, I anſwer that they are not yet come to any ſuch Perfection as to operate, whereas in the mean time the Heart both operates and is mov'd before it can have any Aſſiſtance from thoſe Rudiments of the Brain.

7. Becauſe the Animal Spirits are generated out of the Arterious Blood, which are generated by no other part beſides the Heart. Seeing then that they cannot be generated out of any other Matter, and that this Matter cannot come to the Brain but by the impulſe of the Heart, wherein this Matter is generated, of neceſſity it follows, that the Heart is mov'd of it ſelf, before there are any Animal Spirits in any other part; and is the firſt that forces to the Brain Matter adapted for the Generation of thoſe Spirits; that is to ſay, the Arterious Blood. Perhaps it may be objected that the Heart is mov'd at firſt by thoſe animal Spirits which were mix'd in the Seed of the Parents, and from that time ſtill are intermix'd with it; which is but a frivolous Evaſion. For the animal Spirit concurs indeed to the making of Seed, but loſes its own Nature; and being mix'd, fermented, and concocted with the vital Blood, becomes one Maſs of another Nature with it; and ſo both together put on the Nature of the Seed, wherein there is no longer either animal Spirit or arterious Blood, but that Seed becomes a new Body, generated out of both being mix'd together, and changed by Concoction, which particularly contains in it ſelf, neither animal nor ſanguineous Spirit, but a new Spirit potentially vital ariſing out of the Mixture and Concoction of both, which if at any time it be ſtirr'd up in the Womb, and proceed from Power to Action, will immediately enliven, and form Veſſels and Inſtruments that ſhall produce Spirituous Blood and Animal Spirits. So that there are no Animal Spirits any longer in the Seed that are able to cauſe the firſt Motion of the Heart at the beginning. For as no Man in his Wits will aver that there is any Blood really in a Bone, tho' the Blood, as a neceſſary Matter concurs to its making Nutrition and Growth, ſo no Man will ſay of the Seed, that there is in it either Animal Spirit or Blood, tho' both concur to its Compoſition. For as in the Generation of Bone, the Blood concurring with the Animal Spirit, loſing altogether its Sanguineous Nature, becomes Bone, and is no longer Blood, as the Spirit is no longer Spirit, as it was before: ſo likewiſe in the making of Seed, the Animal Spirit and Blood remain no longer what they were before; whence it cannot be ſaid, that animal Spirits remain in the Seed that ſhould be able to begin the firſt Motion of the Heart.

8. Be-

8. Becauſe the Motion of the Animal Spirits does not proceed from the Brain, but altogether from the Heart, and this Motion of the Heart ceaſing, all Animal Motion ceaſes. As is apparent when Wounds penetrate the Ventricles of the Heart; for that the Blood not being forced into the great Artery and the Heart, but flowing out through the Wound of the Ventricles, preſently at the very ſame inſtant the Brain reſts, and the Animal Spirits are no longer ſent through the Nerves to the moving Parts; neither are they moved in the Brain, which is the reaſon that a Man ſo wounded falls of a ſuddain, depriv'd of all his principal Faculties, and of all Senſe and Motion. The ſame appears in Convulſions and Fitts of the Mother affecting the Heart, and ſuch like Diſtempers; in which frequently the noxious Vapours and Humours reach no farther than the Heart, but not as yet to the Brain, and ſo the Heart ceaſes to beat, the Brain remaining unendamaged; which nevertheleſs upon the ceaſing of the Motion of the Heart, preſently ceaſes to be mov'd, nor does it begin to move again, till firſt the Heart begins to move. But moſt manifeſtly of all does this appear in Wounds of the Head, that take away ſome part of the Scull, and the Brain it ſelf, as we have ſeen in the Camp: For if the Patient fall into a Convulſion, preſently we ſee the Motion of the Heart ceaſes; but if the Heart begin again to beat; which is eaſily perceived by the Patients Pulſe, not before but preſently after ſome Pulſes; the Heart begins by little and little again to be mov'd; and after the Brain, by degrees, all the reſt of the Members are mov'd.

Theſe are all certain Signs that the Heart is not mov'd by the Animal Spirits, thruſt forward into it from the Brain; but that the Brain, and by means of that the Animal Spirits are mov'd by the Blood ſent upward. In the mean time I will not deny, but that by reaſon of certain Nerves ſcarcely diſcernable, deſcending toward the *Baſis* of the Heart, the Orifices of it are ſomewhat leſs, ſometimes more looſen'd or contracted, as in the Paſſions of the Mind, and for this reaſon, that the Blood in the Ventricles is ſometimes more difficultly, ſometimes more eaſily expell'd, according to the various Determination of the Animal Spirits to thoſe Orifices: Nevertheleſs the continual Motion of the Heart does not proceed from thence; tho' this be not the cauſe of any Impediments to hinder from performing its Motion freely and equally; as in the reſpiratory Motion of the Breaſt, ſometimes Impediments ariſe from the Muſcles of the *Larynx*, too much contracted by the help of the Animal Spirits flowing thorough the Nerves, tho' thoſe Muſcles are no cauſe of Reſpiration.

And thus I have ſufficiently diſplayd the Errors of the firſt Opinion.

Whether mov'd by the Dilatation of the Blood.

II. The ſecond Opinion believes ***the Heart is mov'd by the Dilatation of the Heart in its Ventricles.*** For the Blood falling into its Ventricles, becomes preſently very much dilated, and diſtends the Sides of the Ventricles beyond their juſt Poiſe, which by the flowing forth of that dilated Blood thorough the great Arteries, adjoyning to both Ventricles, are preſently contracted beyond their due Meaſure, and diſtended by and by again upon the flowing in of new Blood. As it happens in a Willow Twigg or other Tree; which if you pull down beyond its natural Situation, being let go ſuddainly, it will fly up again beyond its proper and natural Poiſe, and for ſome time Waggs up and down, through the remaining Force of the Violent Motion. This is a ſpecious Invention eaſily refuted. For if the Motion and Pulſe of the Heart ſhould proceed from the Dilatation of the Blood in the Ventricles, then the Influx of Blood failing, the Heart would not be mov'd; becauſe there is no Blood therein to be dilated: But on the contrary, the Hearts of ſeveral Animals being taken out of the Body, and depriv'd of all the adjoyning Veſſels and Blood, ſtill move and beat for ſome time, when there is no Blood contain'd or dilated therein: Nay the Hearts of Eels, Lizards, and other Creatures being cut into pieces, the ſeveral Particles will move for ſome time. *Deuſingius* relates that in a live Dog he cut off the Tip of the Heart, and for ſome time beheld ſtrong Contractions in the Piece cut out, which could never have been, were this Opinion true. *Charleton*, that he might avoid theſe Rocks, chooſes rather to joyn two Cauſes together, and to ſay, That the Heart is diſtended accidentally by the Dilatation of the Blood flowing in; but that it is mov'd and contracted by its own Fibres, and of its own proper Motion. But the Heart of an Eel cut in pieces, ſhews the contrary; ſeeing there is no Blood flows into that to be dilated, and for that the Fibres are

cut,

cut, while nevertheleſs alternate Contraction and Laxation remains.

Whether mov'd partly by the dilatation of the Blood, and partly by the animal Spirits.

III. Others, to avoyd the Rocks both of the firſt and ſecond Opinion, joyn'd the two preceding Opinions both together, and aſſert, That *the Blood ſliding into the Ventricles of the Heart, are inflam'd and rarify'd by the innate Fire it ſelf, and through its expanſion wanting more room, widen the Walls of the Heart: and then the* Parenchyma *of the Heart being moleſted by that Expanſion, calls the Animal Spirits to its Aſſiſtance, which coming in ſufficient quantity, contract the Muſcles which conſtitute the* Parenchyma *of the Heart, and ſo by ſtreightning the Ventricles, thruſt forth the contain'd Blood into the Arteries*; and hence, that the dilatation of the *Heaat* caus'd by the Blood rarefying, is natural; but the contraction by the Muſcles, abſolute and obedient to the Will, is Animal.

Certainly this Opinion is plauſibly propounded, that at firſt ſight there ſeems no doubt to remain; but upon better examination it will appear that the latter part does not well cohere with the former. For it ſuppoſes the whole *Parenchyma* of the *Heart* to be compos'd of Muſcles; which if it be true, then the whole *Heart* is the Inſtrument of voluntary Motion, whoſe motion may be increas'd, diminiſh'd, ſtopp'd, or otherwiſe alter'd at pleaſure. But who, I would fain know, can direct or alter the Motion of the *Heart* at his own Pleaſure? Beſides, the Muſcles to perform a continual Motion, want larger Nerves, and a more copious ſupply of animal Spirits. But it is impoſſible there ſhould flow into the *Heart* any other than a very few Spirits through Nerves almoſt inviſible, not ſufficient for a continual Motion laſting all a man's Life. And whence I pray ſhall thoſe Spirits proceed and flow into the *ſalient or jumping Point*, which is obſerv'd to move firſt in the Bubble of an Egg, before there is any delineation either of Brain or Nerves perceptible?

Whether mov'd by an Ethereal Matter.

IV. Others, to avoid theſe Difficulties, chuſe rather to explain the thing, by giving it the Title *of a Subtle and Ethereal Matter, which is continually agitated and mov'd, and variouſly moves other Bodies alſo upon which it lights; as it penetrates this way or that way, with eaſe or difficulty, through the Pores of theſe or thoſe Bodies.* This Matter, ſay they, lighting into the *dilating* Fibres of the *Heart*, and not able conveniently to penetrate their Pores, by reaſon of their Situation and Figure, is ſtopp'd therein, and filling, diſtends them: hence flowing out again, and lighting upon the contracting Fibres, the firſt being already looſen'd, it fills and diſtends them likewiſe: and ſo they tell us that theſe Fibres are alternately fill'd and diſtended. But this is a Cauſe far fetch'd indeed. For he that here flies to ſome general Cauſe of the Motion of all things, he concludes nothing *in ſpecie*, concerning the Motion of one thing, nor of the Motion of the *Heart*: whereas in the Motion of the *Heart*, we are not to ſeek for the general (which you may as well ſay is God) but for the ſpecial and next Cauſe. Beſides, no Reaſon can be given, why that ſubtle Matter ſhould not light at one and the ſame time upon both the Fibres, as well the contracting as the dilating; but ſhould proceed in an alternate order from one to t'other, as if guided by ſome peculiar Intelligence: nor wherefore in a Creature newly ſtrangl'd, when the *Heart* and other Parts are yet warm, that Ethereal Matter does no longer move the Fibres of the *Heart* after the ſame manner. Should it be ſaid, that there is no Blood that flows then into the *Heart* to be dilated, I ſhall anſwer, that the *Heart* is not mov'd by that dilatation of the Blood, as I have already prov'd: or if that be the Cauſe of the Motion, then not the Ethereal Matter; if it be an aſſiſtance without which that Motion cannot be perform'd, where is that aſſiſtance in the Heart of an Eel newly pull'd out, and cut into peices, whoſe ſeveral particles beat, though there be no Blood therein to be dilated?

Whether mov'd by the Spirit of the Blood.

V. The Fifth Opinion differs much from the former, as aſſerting, *That the Motion of the Heart proceeds from a certain vivific Spirit, which is in the Blood it ſelf, and generates it in it ſelf*; the refutation of which Opinion may be ſeen in the following 11th. Chapter.

Whether mov'd by the Lungs.

VI. Theſe Five Opinions being ſet aſide, *Alexander Maurocordatus* propounds a new and hitherto unheard of Opinion, *That the Heart is mov'd by the reſpiring Lungs, and the Lungs by the Heart, and that theſe two parts give mutual aſſiſtance one to another.* But this Opinion is by us refuted in the following Thirteenth Chapter, to which

we

we ſhall only add theſe few Things. 1. That if the Motion of the Heart proceeded from the reſpiring Lungs, whence does that Motion ariſe in the Birth which is included in the Womb, where the Lungs are idle, and never heave; and which are never to be found in the little *jumping Point* conſpicuous to the Eyes in an Egg? 2. Whence that Motion proceeds in Fiſh, and other Creatures that have no Lungs, and but one Ventricle of the Heart? 3. By what is it occaſion'd in the Hear of an Eel, which after all the adjoyning parts are cut away, ſometimes beats after it is taken out of the Body? That, ſays *Maurocordatus*, is a Trembling Motion. Which we deny, becauſe that for ſome time it obſerves the true meaſure of Beating, till the approach of Death, and then it comes indeed to be a trembling Motion.

Among all the foreſaid ſix Sentences, the ſecond approaches the neareſt to Truth, but only it is to be explain'd a little more at large, and ſomewhat after another manner: For here are two things wanting; in the firſt place, what dilates the Blood; and ſecondly, it does not ſufficiently explain how the Heart is mov'd when the Blood does not flow into the Ventricles. Which two things are to be more narrowly examin'd for the diſcovery of the Truth.

The true Cauſe of the Heart's Motion.

VII. In the firſt Conception, the Spirituous *Bloſſom*, which is in the Seed, is collected and concluded in a little Bubble, wherein there is a delineation made of all the parts by the vivific Seed that lies in the *Bloſſom*, which gives to all the Parts their Matter, Form and Being; and abides in all and ſingular the Parts being form'd, and variouſly operates therein according to their diverſity. The moſt ſubtle and ſharpeſt part of this is ſetl'd in the Heart, which by its extraordinary acrimony obtains an extraordinary power of Fermentation, by which the Humors pouring into the Heart, are there dilated, as Gunpowder is dilated and ſet afire by the heat of the Flame. And as Gunpowder has no actual heat in it ſelf, but being kindled, receives a burning heat, ſo the Blood in the Heart being dilated by that ſame Spirit, waxes very hot and fiery. By reaſon of which heat *Carteſius* calls this Spirit *a continual heat abiding in our Hearts as long as we live, which is a kind of Fire, which the Blood of the Veins nouriſhes, and is the corporal beginning of all the Motions of our Members.* For that this Spirit by its continual agitation and dilatation, ſupplies the heat with a continual fewel. But in regard it is much diſſipated by this continual agitation, it has need of continual ſupply, to the end the diſſipated Particles may be continually reſtor'd. This Supply is maintain'd by the moſt ſubtle Particles of the Blood attenuated in the Heart, entring the Pores of the Heart, and infus'd into it through the Coronal Arteries, which Blood, if it be good and ſound, then this Spirit is rightly ſupply'd, and the Heart continues ſtrong and vigorous; if otherwiſe, through bad Diet and deficiency of the Bowels, then this Spirit is ill ſupply'd, and the Heart becomes weak and infirm.

Now this Spirit abiding in the whole ſubſtance of the Heart, forthwith dilates in the Heart, both the Blood and all other proper humors whatever. Which Action is ſometimes ſwifter, ſometimes ſlower, more vehement, or weaker, as the Matter to be dilated is fitted more or leſs for dilatation, by the fermentaceous Particles mix'd with it: and the Spirit it ſelf is more or leſs vigorouſly ſtirr'd up into Act by the greater or leſſer heat: for theſe two things are the cauſe of all alterations of Pulſes. Thus in Fevers, where there is more or leſs heat, and the Matter to be dilated is thinner and more volatile, there the Pulſes beat thicker and ſwifter. But if that Matter, as is uſual in putrid Fevers, has many unequal Particles, ſome more, ſome leſs eaſie to be dilated, then the Pulſe becomes unequal: if the Blood be colder and thicker, the Pulſe is ſlow and beats ſeldom. When it is cool'd, it diminiſhes at firſt, then ceaſes altogether: but being warm'd again with new Blood or warm Water, it preſently begins to beat again.

The ſaid Spirit being ſtirr'd up by the heat, by and by dilates and ferments the Humors, and that two manner of ways. Firſt, By fermenting thoſe Humors that flow in great quantity through the hollow and *Pulmonary* Vein, into the Ventricles of the *Heart*, by the fermentation and dilatation of which, and the rapid agitation of the leaſt Particles between themſelves, a great heat is kindled in the *Heart*. This heat preſently whets and ſharpens the ſame Spirit abiding in the innermoſt and thicker ſubſtance of the *Heart* and its Fibres, which ſo excited, preſently ſomewhat dilates the ſubtle Blood infus'd into the Subſtance and Fibres for Nouriſhment; and hence it is, that the Fibres of the *Heart* are forthwith contracted, which cauſes an expulſion of the Blood in the Cavity

Cavity of the Ventricles. Then again new Blood flowing into the Ventricles, there happens a dilatation of the same, with a sharp Heat, and by that means a distension of the Ventricles at the same time, which by reason of the kindled heat, presently follows dilatation of the same into the Pores of the Substance about the Fibres, and by that means there happens again a contraction of the whole Heart and Ventricles; which things proceed in a certain order so long as Life lasts. Now this Motion proves the more vehement, because the Fibres being dilated beyond their poise, presently when the Blood dilated in the Ventricles, easily breaks forth through the broad Arteries, they are as easily again contracted beyond their measure by the dilatation of the inner Blood; so that same distension and contraction beyond the due *Æquilibrium*, causes indeed the Pulses to be stronger, but yet they are not the first cause of the Motion, which is only an alternate dilatation of the Blood, sometimes in the Ventricles, sometimes in the Substance of the Heart.

Why the Heart of an Eel taken out of the Body beats.

VIII. Hence it appears, why Pulsation remains in the Hearts of Eels, and other vivacious Creatures, being taken out of the Body, though no Blood be then pour'd out of the great Vessels into the Ventricles; because the said Spirit abiding in their hearts, is easily rais'd into Act by the small remaining heat; and acts upon the Blood abiding in the Substance it self, and by something dilating of it, contracts the Fibres. Afterwards that dilated Matter being somewhat dispell'd, they are again relax'd. Which not only appears in hearts that are whole, but in the hearts of some after they are cut into pieces, and in the several pieces themselves. But because in such cases there is no new Blood dilated in the Ventricles, and consequently no new heat nor any distension of the Fibres beyond their Position, hence in hearts that are taken out, and cut in pieces, the motion is weak, and quickly ceases.

This I perswade my self to be the true cause of the Motion of the heart, till some body else shall shew me any other more probable.

CHAP. VIII.

Of the Pulse and Circulation of the Blood.

Digression.

I. *THE Motion of the Heart is* by the *Greeks* call'd σφύξις, by the *Latins*, *Pulsus*; *by which the Heart alternately rises and falls.* It is perform'd by Dilatation and Contraction, between which two Motions there is some little kind of Rest.

Dilatation.

II. In Dilatation, the sides of the Ventricles after they have expell'd the dilated Blood into the Arteries by the contraction of the Fibres, presently by the rarefaction of the Blood sliding in again, they are thrust from the middle *Septum*, and so rise again. In Contraction *Bauhinus* and *Harvey* believe, that the heart is extended in length, the Tip receding from the Base; and so the sides of the Ventricles being thrust forward toward the middle *Septum*, that the Blood is thereby expell'd: which also seems to be the Opinion of *Ent.* But the dissection of living Animals teaches us the contrary, by which it is manifest that the heart in Contraction is contracted every way together, that is to say, that the distended sides of the Ventricles are contracted every way together, and together ascend the Cone toward the Base, and so the heart being now swell'd by the dilated Blood, grows rounder and harder, and by that contraction of the whole that the Blood is forc'd out of the Ventricles. Which that it is so, not only Experience but Reason demonstrates; seeing that by the dilatation of the Blood contain'd in the interior Pores of the Substance, all the Fibres of the Heart are at the same time contracted every way together, as we have said already.

When the Cavities are broadest.

III. Here arises a Question, *Whether the Cavities of the Vessels are larger and wider, when the Heart is contracted into a rounder Figure, or when it is extended in Length. Harvey* thinks the Cavities are larger when the heart is extended in length, but narrower when the heart is contracted. 1. Because that in Contraction the heart becomes harder. 2. Because that in Frogs, and other Creatures that have little Blood, it is at that time whiter or

leſs red, than when it is extended in length. 3. Becauſe if an Inciſion be made into the Cavity of the Ventricle, preſently the Blood guſhes out of the Wound, otherwiſe than as it happens when it is extended in length. *Harvey* might have alſo added this Experiment, by cutting away the Tip of the Heart in a living Dog, and thruſting a Finger into the Cavity of either Ventricle through the open'd Paſſage: for then he would have manifeſtly perceiv'd a preſſure upon the Finger by the contraction of the heart, and that compreſſure to ceaſe upon its being extended. *Carteſius* being quite of another Opinion, tells us, That the Heart in Contraction becomes harder, but broader on the inſide, by reaſon of the contain'd and ſuddenly dilated Blood, and for that it manifeſtly appears to the Eye, is not diminiſh'd in magnitude, but rather ſomewhat augmented, and that for this very reaſon at that inſtant time it becomes harder, and the Blood leſs red in Creatures that have very little Blood; becauſe by that dilatation the Fibres of the heart are extended, and by virtue of that diſtention, preſs forth in good part at that inſtant of time the Blood in the Pores of the heart, and renders it more ruddy. He confirms this by an Experiment, and ſays, That if you cut away the ſharp end of a heart of a young Coney, then you may diſcern by the Eye, that the Cavities are made broader at the ſame moment that the heart is contracted, and becomes harder, and drives forth the Blood. Nay when all the Blood of the Body being almoſt exhauſted, it ſqueezes forth only ſome few little drops, yet the Cavities at the time of expulſion retain the ſame breadth of dilatation: Laſtly, he adds, That in Dogs and other ſtronger Animals, this is not ſo viſible to the ſight; becauſe the Fibres of the heart are ſtronger in them, and poſſeſs a great part of the Cavities. But though theſe Reaſons of *Carteſius* are very ſtrenuous, I think however there is ſome diſtinction to be made as to the Time, that is to ſay, in the beginning and end of the Contraction, and the very inſtant when the Contraction firſt begins, the Cavities are wider, becauſe of the dilated Blood contain'd therein: but when the Blood breaks forth out of them into the great Veſſels, that they are at that very moment of time more narrow, the Fibres being contracted every way toward the inner parts beyond their ſtretch: and that I believe may be obſerv'd by diligent inſpection into a live heart.

IV. Beſides the Pulſes, *Bartholine* makes mention of two other Motions of the Heart, *Undation* and *Trembling Motion*. But in regard that theſe are nothing elſe but certain *Species* of a vitious and diſeaſed Pulſe, they are to no purpoſe deſcrib'd as new Motions. *Vicious Motions.*

V. ***The Uſe of the Pulſe is to force the Blood dilated in the Heart thro' the Arteries to all the Parts of the Body, to the end that all the Parts may be nouriſh'd thereby; and that the particular Parts may be able by virtue of a proper Faculty to concoct, alter and convert into a Subſtance like its own, ſome part of that Blood, and apply it to themſelves, and return the remainder to the Heart again; there to be again dilated, ſpiritualiz'd, and indu'd with new vigor.*** *The Uſe of the Pulſe.*

VI. But ſeeing that by the daily reciprocation of the Pulſe, there happens a daily expulſion of Blood from the heart, there is a neceſſity that the heart ſhould continually draw from the hollow Vein, Blood ſufficient to fill the Veſſels as Nature requires. But becauſe the hollow Vein is never exhauſted, and moreover, becauſe the Arteries, into which there is a continual expulſion, never ſwell to exceſs, it follows, *That this Motion muſt proceed circularly, and that the Blood muſt be continually empty'd out of the Heart into the Arteries, and out of them into the Veins and Parts to be nouriſh'd, and thence return from the leſſer Veins to the hollow Vein, and ſo at length to the Heart.* *Circulation of the Blood.*

This Circulation is confirm'd by three moſt ſtrenuous Arguments.

VII. ***The great Quantity of Blood empty'd out of the Heart into the Artery.*** Which is ſo much, that the hundredth part of it cannot be ſupply'd by the receiv'd Nouriſhment; when that emptying proceeds and is carry'd on, as equally in a man that has faſted two or three days, as in one that has fed well. So that unleſs the Blood ſhould return from the Arteries through the Veins to the heart, the heart in a ſhort time would want Matter to empty: beſides, all the Arteries would burſt in a ſhort time, and the Parts into which the Blood flows, would ſwell after a wonderful manner. For the heart of a ſound man in the ſtrength of his Age, beats in one hour 3000 or ſomewhat more Pulſes. *Cardan* reckons 4000. *Bartho-* *First proof from the plenty of Blood.*

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lin 4400. And *Rolfinch* has number'd in himself 4420. So that if by every particular Pulse only one scruple of Blood should be empty'd into the *Aorta*, it will be found by computation, that eight or nine pound *Averdupois* weight of Blood must pass through the Heart in one hour, and consequently thirty or forty pound in four hours: according to the greater or lesser number of the Pulses. I mention'd the least weight; for we find by ocular inspection, that two drams and more have been empty'd by every particular Pulse, in the dissections of live Dogs; and yet 'tis very probable, that there is not so much Blood to be empty'd in the whole Body of Man. Moreover, if in Bloodletting we consider the quantity of Blood that immediately flows out, and consider likewise how much in the mean while is circulated at the same time through Myriads of other Veins, where the progress of the Blood is hindred by no Ligature, all which Blood passes through the Heart; we shall easily observe, that in a man by each particular Pulse, not a few drops, not a scruple, not one or two drams, but much more, perhaps half an ounce or more are emptied out of the Heart into the great Artery: which is yet much more apparent in *Artery-cutting*. When if we consider what is empty'd out of every small Artery cut, by every particular Pulse, and what is empty'd by all the rest by the same Pulses, we shall find a vast quantity pass through the Heart; since it is certain that there is as much Blood empty'd out of one *Aorta*-Artery, out of the left Ventricle of the Heart, as out of all and singular the Arteries deriv'd from the *Aorta*, if they were open'd. Seeing then that by so great a quantity, neither the Arteries are distended to excess, nor that any other parts swell, nor that the hollow or other Veins are empty'd; certain it is, that the Blood empty'd into and through the Arteries, flows back through the Veins to the Heart.

The First proof from the plenty of Blood.

The Second Proof from the Situation of the Valves.

VIII. *The Situation of the Valves in the Veins*, which in all Men is such, that the Blood may flow freely through them to the Hollow Vein; but nothing from the hollow Vein to the lesser Veins: For if you blow into the hollow Veins with a Straw; nothing of that Breath will enter the lesser Veins: But if you blow the lesser Veins, the Breath will presently enter the greater, and so to the Hollow.

The Third Proof from Ligature in Bloodletting.

IX. *The Ligature in Bloodletting.* For the Arm or Thigh being bound near the place where the Vein is to be open'd, the Ligature causes the Veins to swell underneath. Because the Blood being forc'd through the Arteries toward the external Parts, returns thorough the Veins and ascends upwards, and when it comes to the Ligature there it stops; which causes the Vein to swell below the Ligature, so that the Blood not able to ascend any farther, flows out at the little Hole made with the Lancet. Again, the Ligature being unty'd, the Efflux ceases, because the Blood can then ascend more easily through its little Pipe, which is sufficiently wide, than issue forth at the narrow Wound. Moreover, if that same Ligature be ty'd so hard, that the Blood cannot pass through the Arteries themselves toward the lower Parts, then nothing will issue forth neither; because the Blood is not forc'd through the Arteries toward the lower Parts, and consequently cannot ascend through the Veins to the upper Parts: But loosning that Ligature never so little, and the Pulse more freely penetrating the Artery, presently the Blood will flow out of the open'd Vein. Moreover also, any Ligature or Compression of the Veins and Arteries in living Animals, is forc'd through the Arteries from the Heart, and through the Veins flows to the Heart. For above the Ligature, that is, toward the Heart, the ty'd Arteries swell, by reason of the Passage deny'd to the Blood; but the Veins fall, by reason of the free Efflux of the Blood to the Heart. The contrary to which happens below the Ligature.

These Reasons alone are sufficient to prove the said Circulation: Besides which there are many others, apparent and probable, which here for brevities sake I pass over, concerning which *Harvey*, *Riolanus*, *Conringius*, *Ent*, *Highmore*, *Deusingius* and others, may be consulted, who have written whole Treatises particularly concerning the Circulation of the Blood.

I shall add one thing concerning the manner of Circulation, wherein perhaps I shall differ from others.

The manner of Circulation.

X. There are two Opinions concerning the manner of Circulation, of which one is *Riolanus*'s, approv'd by few: The other Common; which most Philosophers maintain.

Riolanus *his manner*

XI. *Riolanus* holds, *That the Blood Circulates only through the larger Veſſels; but that that which is pour'd forth to the leſſer Branches, never returns to the wider Channels, but is conſum'd in the Nouriſhment of the Parts; moreover, that the Blood of the firſt Region does not Circulate, but is conſum'd likewiſe in the Nouriſhment of the Parts conceal'd therein.* But this Opinion at this day is utterly rejected by all learned Men; there being no Reaſon to be given, why the Blood, forc'd through the Arteries in greater Quantity, than is requiſite for the Nouriſhment of the Parts, ſhould not with equal neceſſity circulate through the ſmalleſt Veins, as if it were forc'd through the greater Arteries. Or why the Blood forc'd through the *Coeliac* and Meſenteric Arteries in great quantity to the Stomach and Inteſtines, ſhould not circulate thorough the Veins of the ſame Parts. Eſpecially ſeeing that Experience contradicts him in both theſe Caſes. For that if you cut the ſmalleſt Artery in the Extremity of the Hand or Foot, more Blood flows out in one hour, than is requiſite for the Nouriſhment of the whole Hand or Foot, a whole day together. And our own Eye-ſight ſhews us, in the Diſſections of Living Creatures, that upon tying the Meſenteric Veſſels, the Blood is forc'd through the Arteries to the Inteſtines, and that a ſufficient Quantity alſo flows back through the Veins to the *Portevan.*

The common manner.

XII. The common Manner affirms, *That the Circulation of the Blood is caus'd by the* Anaſtomoſes *of the Veins and Arteries, by which the Orifices of the Arteries are united with the Orifices of the Veins; and mutually open one into another: So that where-ever any ſuch* Anaſtomoſes *are, there is alſo Circulation.* I thence conclude, that where thoſe *Anaſtomoſes* are not, there is no Circulation.

It would be a very difficult thing to uphold this Opinion; for that thoſe *Anaſtomoſes* are very few in the larger Veſſels, and tho' they may be more numerous in the ſmall Ends of the diminutive Veſſels, which however are not every where diſcernable to the Eye; yet becauſe of the extraordinary Narrowneſs of ſuch Paſſages, very little Blood can paſs through them; not the ſixth, no, not the tenth part of what is forc'd through the Arteries can enter the Veins. Beſides, how ſhall the Parts be nouriſhed by the Blood paſſing through thoſe *Anaſtomoſes*, to which there is nothing contributed in that Paſſage? Perhaps you will ſay, there is as much allow'd 'em by Exhalation, as is ſufficient. But hence it would follow, in regard the thin *Serum* is moſt apt for ſuch an Exhalation, that all the Parts are nouriſhed by *Serum*; becauſe the Blood being ſomewhat thicker, cannot eaſily exhale through the Pores of the Veſſels. But this is abſurd; becauſe the *Serum* is added to the Blood only for a *Vehicle*, and not for the Nouriſhment of the Parts, and that carries the Blood thorough the Ends of the Arteries into the Pores of the Subſtance, from whence it then partly exhales inſenſibly, partly returns with the remaining Blood into the Veins. *Laſtly*, granting that Circulation is only cauſed by the ſaid *Anaſtomoſes*, how comes it to paſs then in a Dropſie, that Circulation ſhall proceed from the Subſtance of the Parts into the Veins? For in the Dropſie the *Serum* is not concluded in the Veſſels only, but of neceſſity abides in the Subſtance of the Parts. Shall then that *Serum*, which in that Diſeaſe is more crude and thick, paſſing out of the Arteries by Exhalation, enter into the Veins again by *Inhalation*, that ſo it may be circulated through the Heart, and thence flow to the Urinary Paſſages, and be empty'd through them? As the Obſervations of Phyſicians teach us, that that ſame Diſeaſe is ſometimes cured by a copious Flux of Urine. How ſhould the large ſoft Tumours of the Parts fall in a ſhort time, without any manifeſt Evacuation, if the Humours contain'd without the Veſſels in the very Subſtance it ſelf of the Parts, never return into the Veins? How can they enter them united together with the Arteries to their Ends? All which things ſufficiently demonſtrate the Errors of the common Opinion.

The true manner of Circulation.

XIII. The true manner of Circulation preſently ſhews it ſelf, upon the more accurate Conſideration of what has been ſaid. And it is apparent, *That the Blood does not only Circulate through the ſaid* Anaſtomoſes, *but through the Subſtance it ſelf of the Parts.* For a great quantity of Blood is conveighed through the Arteries, of which a good Quantity flows through the Ends of the ſmalleſt Arteries, into the Pores of the Subſtance of the Parts, for the Nouriſhment of which

which there is so much applied to every part as is necessary, or fit to be apply'd and assimilated: The remainder proceeds farther, and enters the Orifices of the smallest Veins adhering to the Parts, and so proceeds farther still to the larger Veins: Now that the Blood flows into the Pores of the Parts, and returns through those into the Veins, is apparent from every slight Cut of the Skin, out of which, the Vessels being untouch'd, the Blood presently gushes. But because the Diminutive Arteries apparently ending in the Substance of the Parts, are very narrow; thence it comes to pass that they transmit more Blood than is needful for Nourishment; yet in the mean time the Blood which remains over and above, is no less, which cannot be emptied through them into the Pores of the Substance. Therefore that it should not settle and corrupt in the Arteries, the chief Creator allow'd these *Anastomoses*, that the Redundancy should pass through them into the Veins. Such is that remarkable *Anastomosis* which we have observ'd at the Entrance into the Spleen, and two others in the Birth, one in the Heart through the Oval Hole, another in the *Pulmonary* Artery, where it joyns with the *Aorta*. This Opinion of ours is confirm'd by *Harvey*, *Plempius*, *Pecquet*, and *Charleton*. Of which the latter two, not without reason, beleive that a greater part of the Blood returns through the substance of the Parts of the Veins, then through the *Anastomoses*, with whom *Nicholas Hobken* agrees. *Rejecting any Anastomosis*, saies he, *I say it suffices, if the arteries are so inserted and joyn'd to the Parts that are enliven'd, as to penetrate deeply into their Substance, ending in a Branch of small Threads variously spreading it self: And if they continually and aptly enjoy the Company of the Veins in like manner inserted into the Substance of the same Parts.*

There is no reason to fear Tumours, Inflammations, Apostemes, *&c.* because the Blood is poured forth without the Arteries into the Substance of the Parts: For by reason of the Narrowness of the Arteries ending in the Substance, no more flows in than can pass conveniently through the Pores, and be again suckt in by the Orifices of the Veins. But some will say, that by labourous Exercise and heating of the Blood, it is forc'd in more strongly, and in a greater Quantity, then at other times; therefore then at least too great a Quantity will flow into the Substance and produce those ill Effects. I answer, That the Blood then, by reason of its greater Heat is thinner, and the Pores also broader, and the Orifices of the little Veins more open for its Passage. But if the Pores become more narrow, either by Constitution or sudden Refrigeration, or by any other Accident, or that the Blood becomes thicker in the Parts, then to be able to enter the narrow Orifices of the little Veins; then indeed too great a Quantity of Blood would be gathered together in the Substance of the Parts, and beget the same Mischiefs. For this is the chiefest Cause of the Pleurisie, Quinzey, Inflammation of the Lungs, *&c.* Of which Cause they were not aware, who thought the Circulation ran only through the *Anastomoses* of the Vessels only. For they teach us that by reason of the convenient Passage of the Blood deny'd, that the Vessels are fill'd to the utmost; whence the Parts are distended into Tumovrs by the Vessels being over-fill'd; but because more Blood cannot be forc'd into the over-fill'd Vessels; hence the Blood which is collected within them, is deprived of a new Afflux of Arterious Blood, and so comes to be refrigerated, and not inflam'd, as *Regius* will have it. But they do not consider, that the whole Blood does not pass through the *Anastomoses* of the Vessels, but the greater Quantity of it is forc'd into the Pores of the Substance of the Parts; out of which if the redundant Quantity does not flow in due time into the Veins, then of necessity there happens a swelling of the Parts. And because the several particular drops of Arterious Blond, flowing to each Pulse, contribute their heat, hence by the overmuch increase of the Blood in the Part, the Tumor increases, and there is at the same time an augmentation of heat, and this intense heat begets an effervescency of the collected Blood, and an inflammation of the Part with a Tumor. Though I will not deny, but that Effervescency may be occasion'd by a small quantity of Blood, but sharp, and prone to boil, when it overflows into any part; and then happens an Inflammation without a Tumor, as in St. *Antony's* Fire.

The Cause of Inflammations.

For further illustration of this Matter, take a Spunge wrapt up loosly in a piece of Leather, and furnish'd in the lower side with three or four Leaden Pipes; then through a little hole cut in the Leather on the upper side, force in a quantity of Water with a Syringe, it will

conveniently be diſtributed through the Pores of the Spunge, and there will remain in the Spunge as much Water as will ſerve to moiſten it; the remainder paſſing through the Pores of it, and paſs of its own accord through the Leathern Pipes at the bottom; but not with ſuch an impulſive Motion, as it is forc'd in at the upper part out of the Syringe. I ſay, *through the Pores*, becauſe there is no need of middle pipes to convey the Water into the lower Pipes: for that the Pores of the Spunge afford a ſufficient paſſage. But if theſe Pores are ſtreightned, and the lower Pipes are contracted by any Accident, that the Water cannot paſs equal in quantity and ſwiftneſs; then the Spunge receiving more than it can tranſmit, begins to ſwell, and conſequently the looſe piece of Leather wherein it is wrapt, becomes diſtended, hard and tumid. The ſame will happen if any viſcous Matter be forc'd through the Syringe into the Spunge, by which the Pores and Paſſages are ſtopt up; for then receiving much more than it can well diſcharge, of neceſſity it will riſe into a Tumor. He that will apply this Similitude to the Body of Man, will find the Circulation of the Blood to be occaſion'd in like manner through the Pores of the Subſtance, and hence perceive the Cauſe of moſt Swellings.

The Uſe of Circulation.

XIV. There is an extraordinary and manifold neceſſity of this Circulation.

1. Seeing that the Blood being once diſcharg'd into the Parts, the farther off it flows from the Hearth of its Fire, is ſo much the more refrigerated, and leſs a part for nouriſhment; there is a neceſſity of its return to the Fountain of heat, the Heart, to be again new warm'd and attenuated therein, which return is occaſion'd by this Circulation.

2. Without this Circulation, neither could the Blood be forc'd to the Parts that are to be nouriſh'd, nor could that which remains after nouriſhment together with the *Chylus*, be carry'd back to the Heart.

3. By means of this, all the Particles of the Blood are made fit for nouriſhment by degrees, and according to a certain order. For there being no long Concoction in the Heart, but only a certain ſwift Dilatation, therefore the *Chylus* upon its firſt paſſage through the Heart, does not acquire the abſolute perfection of Blood, but at ſeveral paſſages, ſometimes theſe, ſometimes thoſe Particles become more ſubtile and fit for nouriſhment.

4. By the help of this Circulation, the virtue of Medicines taken and apply'd, is carry'd through the whole Body, or the greateſt part thereof.

5. By means of this the Blood is in continual motion; and preſerv'd from congealing and putrifying.

6. By means of this we come to the knowledge of many Diſeaſes; concerning which in former time many Diſputes have ariſen among Phyſicians.

7. By means of this, Phyſicians alſo underſtand how to undertake the Cures of moſt Diſeaſes; whereas formerly they only proceeded by uncertain Conjecture.

There is no neceſſity that I ſhould here refute in particular the vain Arguments of *Primroſius*, *Pariſianus*, and others, who ſtifly endeavour to oppoſe this Circulation, and uphold the darkneſs of former Ages; remitting the Readers that deſire to be more particularly inform'd of theſe things, to *Ent*, *Highmore*, and ſeveral others, who make it their Buſineſs to refute the Arguments of ſuch as uphold the contrary Opinion.

Whether the Chylus *and the* Serum *circulate.*

XV. But here remain two more Doubts; 1. *Whether the* Chylus *circulates through the whole Body?* 2. *Whether the* Serum *circulates in like manner?*

I anſwer, That as to the *Chylus*, ſo long as it is not within the command of the Heart, and before it has enter'd the Veins, it is not forc'd by the beating of the Heart, and conſequently does not circulate. Thus the *Chylus* contain'd in the Milky Meſenteric and Pectoral Veſſels, is thruſt forward by the compreſſure of the Muſcles and other parts, but is not mov'd further forward by the beating of the Heart, ſo long as it has not enter'd the Veins. So the *Chylus* falling out of the Milky Veſſels into the Breaſts, circulates no farther, but like Milk is either ſuckt, or flows of its own accord out of the Teats. But if any part of it there enter the Mamillary Veins, that ſame ſtill retaining the form of Milk or *Chylus*, is convey'd together with the Vein-Blood to the Heart; wherein being dilated, preſently it loſes the form of *Chylus* or Milk, and aſſumes the form of Blood, at firſt more crude, or leſs ſpirituous; but afterwards to be more and more perfected by ſeveral paſſages through the Heart. And ſo it does not circulate through the whole Body in the form of *Chylus*, but in the form of Blood, having no manner of ſimi-

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litude with the *Chylus*. Whence it comes to pass that there is no *Chylus* to be found, or that can be found in the Arteries. In like manner neither does the *Chylus* circulate in Women with Child toward the *Cheese-cake* or *Amnion*. As neither does it in some Women not with Child, but flowing likewise to the Womb, is corrupted and putrefies about the Womb; and flows forth with more or less ill smell, according as its Corruption is more or less. Which is most probable to be the most obvious Cause of Uterine Fluxes. Also the *Chylus*, that sometimes flows to the Urinary Bladder, cannot circulate. All which things being consider'd, we must conclude at once, that the *Chylus* does not circulate through the whole Body, but that entring the Veins, it retains the form of *Chylus* only so far as the Heart, and there loses its form upon the dilatation. As for the *Serum*, this is also to be said, that it does not circulate, but when it enters the Blood-bearing Vessels. For no Humors circulate by virtue of the beating of the Heart, till after they have enter'd the Limits of the Heart's Command, and become subject to its Motion. But so long as they acknowledge any other Mover, such as are the *Peristaltic* Motion of the Stomach, Guts, and other parts, and the compressure of the *Abdomen*, &c. they never circulate. As the *Serum*, when having pass'd beyond the Bounds of the Heart's Empire, it falls into the Ureters and Bladder. And the Flegmatic *Lympha*, when separated from the Blood of the *Choroidal Fold*, it comes to be deposited in the Ventricles of the Brain, circulates no more; tho' it circulated before, when it was mix'd with the Blood.

The Cause of Uterine Fluxes.

CHAP. IX.

Of the Parts of the Heart. See the 9th. Table.

The Parts of the Heart.

I. IN the Heart are these Parts to be specially consider'd: *Two little Ears*; *two Ventricles with a middle* Septum *that distinguishes them*; *eleven Valves*; *and four large Vessels*, of which, two adhere to the Right Ventricle; *the hollow Vein of the Pulmonary Artery*; and two adhere to the Left Ventricle, the Pulmonary Vein, and the *Aorta*- Artery.

Now let us us see in what Order the making of that enlivening *Nectar* proceeds in this Ware-house of Sanguification: To which purpose we shall produce the several Parts in that Order, as Nature makes Use of 'em in the execution of this Office.

The little Ears.

II. *The* Little Ears *are as it were* Appendixes *to the Heart, seated on both sides at the* Basis *of the Heart, before the Orifices of the Vessels, carrying the Matter to the Ventricles, and from some sort of likeness to the Ears call'd the* Little Ears *of the Heart.*

Their number.

III. *They are two in number, of which the Right and looser is plac'd next the* Vena Cava; *the Left, which is the lesser, thicker and firmer, joyns to the* Pulmonary Vein.

They are both remarkable for their more than ordinary bigness in the *Embryo*.

Their substance.

IV. *They are compos'd of a peculiar Nervous Substance, though somewhat thin and soft, for more easie Dilatation and Contraction.*

The Superficies.

V. *Their outward Superficies appears to be full of Wrinkles; but smooth when fill'd and distended.*

Their Cavity.

VI. *They are both concave, and supported on the inside with strong and nervous Fibres, as with Pillars; between which are to be seen certain little Furrows, fewer on the Right side, more on the Left.*

Colour.

VII. *In the Birth and new-born Infants, they are of a ruddy Colour, in Persons of ripe years somewhat darker than the Heart; which nevertheless, in Dilatation, by reason of the Blood receiv'd, grows more ruddy; in Contraction, the Blood being discharg'd, becomes paler.*

Motion.

VIII. *They are dilated and contracted, like the Ventricles of the Heart, but varying in Time.* For always the dilatation of the Ventricles concurs with the contraction of the Ears; and the contraction of the Ventricles concurs with the dilatation of the Ears: as appears by the Dissection of Living Creatures. Which teaches us also,

alſo, that they continue a weak palpitation when the motion of the Heart fails, and are as it were the laſt parts that die. Hence *Harvey* and *Ent* were of opinion that they were firſt enliven'd, and that the beating little Veſſel that appears firſt in the Egg, was the little Ear, and not the Heart: Which *Deuſingius* oppoſes; and which ſeems to be an Error by the number it ſelf; ſeeing the Heart has two little Ears, and only one jumping little Veſſel appears in the Egg: which, in all probability ſeems rather to conſtitute the Heart, which is ſingle, than the *Ears*, that are two.

Their Uſe. The Ventricles.

IX. *Their Uſe is to receive the Blood firſt of all from the Veſſels that bring it in, ſlightly to ferment and prepare it, and ſo prepar'd to ſend it to the Ventricles.* *Walæus* believes 'em to be the Meaſures of the Blood carry'd to the Ventricles from the Veſſels that bring it in: which Opinion *Riolanus* alſo approves. But *Sennertus*, that they are appointed for the particular Attraction of Air for the making of Spirits. But how much he is deceiv'd, we have already told you, and ſhall further declare in the following Thirteenth Chapter.

Unnatural Things

X. *The Heart has two Cavities, call'd* Ventricles, *diſtinguiſh'd by the* Middle Septum, *which is fleſhy, cloſe and thick, gibbous on the Right ſide, concave on the Left, a wonderful piece of Workmanſhip, wrought on both ſides with little Pillars or Sinews, and ſeveral little Caverns, but no where pervious.* Theſe Sinews ſome take for Muſcles, and little Fibres proceeding from them, and extended as well to the treble-pointed as the Mitral Valves, and to be the Tendons of thoſe Muſcles conducing to the Contraction of the Valves of the Heart. Whence appears the Error of the Ancients, who wrote that the Blood paſs'd through its broader pores from the Right to the Left Ventricle. Certainly if there were any ſuch pores, diligent Nature had in vain provided that Oval Hole in the *Baſis* of the Heart, and that ſome middle Veſſel, which joyns the Pulmonary Artery with the *Aorta*; for then there had been no need of theſe paſſages; if the Blood could have paſs'd through the pores of the *Septum* from the Right into the Left Ventricle. And therefore *Realdus Columbus* deſervedly oppoſes that ancient Opinion, and truly informs us that the Blood is thruſt forward into the Lungs out of the Right Ventricle through the Pulmonary Artery; and from thence deſcends into the Left Ventricle through the Pulmonary Vein. Farther alſo he writes, That he had found that ſame *Septum*, by which the Ventricles are diſtinguiſh'd, to be griſtly in ſome Bodies; a certain ſign that the Blood could not paſs through that, from the one to the other Ventricle. Let *Riolanus* therefore hold his peace, who ſo ſtifly defends the paſſage of the Blood out of the Right Ventricle to the Left through the *Septum*, that he ſuppoſes Figments for Foundations, and affirms that the *Septum* is not only conſpicuouſly pervious toward the Point, but alſo that there are certain little holes in it. Perhaps *Riolanus* might ſee theſe holes in his Sleep, which never could be found by any Anatomiſt that was awake, either in a raw or boyl'd Heart. Only *Dominic de Marchettis* writes, that he found once two holes in the upper part of the *Septum*, which were furniſh'd with Valves in the Left Ventricle. But without doubt he was deceiv'd by one great oval hole, which in new-born Children is always to be ſeen, but afterwards is clos'd altogether, and this by reaſon of its extaordinary Breadth, he took to be two.

bred in the Ventricles.

XI. In the Ventricles ſometimes various Things are bred contrary to Nature, though the Phyſician can hardly tell what the Patient ayls. Sometimes we have found little Gobbets of Fat, and as it were little ſoft whitiſh pieces of Fleſh about the bigneſs of half an Egg, and ſometimes bigger. In *October* 1663. we diſſected a Virgin about three and twenty years of Age, who in her Life-time had often complain'd of an extraordinary heavineſs and palpitation of her Heart, and had often fallen into ſwooning Fits, and ſo dy'd. In whoſe Body we found ſuch a Gobbet of Fat, almoſt filling the Right Ventricle, and another little one in the Left, and after a more diligent Search, we found, that it was no kind of Body bred by the coagulation of Blood, but really a firm piece of Fat, not to be crumbl'd between the Fingers. And this we judg'd to be the Cauſe of her Death: for we could find no other in the whole Body. Neither did ſhe complain in her Life of any other Diſtemper than of that Anxiety, and thoſe ſwooning Fits, which the ignorant People of the Houſe took for Convulſions or Fits of the Mother.

In

In *Decemb.* 1668. In another young Wench of the same Age, we found in the Right Ventricle such another Body of Fat about the bigness of half a Hen-Egg. And both *Bauhinus* and *Riolanus* write, That they have often met with such pieces of Fat. *Smetius* also tells us two Stories of a whitish Substance found in the Heart, about half a Fingers length, a Thumb's breadth, resembling the Marrow of the Leg of an Ox, furnish'd with several Appendixes. *Tulpius* tells us of a Flegmatic *Polypus*, found by himself in the Left Ventricle. *Vesalius* writes, That he found in the Left Ventricle of the Heart two pounds of a blackish Kernelly sort of Flesh (which seems to be an Error of the Printer, instead of two Ounces:) the man, before his Death being very sad, very wakeful, and his Pulse beating very unequally. *Benivenius* tells us, That he found in one Body a piece of Flesh like a Medlar; and in another, a hard brawny Substance about the bigness of a Nut. *Nicholas Massa* met with a Mattery Apostheme, with an Exulceration of the whole little Ear. *Matthias Cornax* met with a corrupt Exulceration and much Matter. *Salius*, *Horstius*, and *Antonius Severinus* met with Worms in the Ventricles. *Hollerius*, by the Report of *Laurentius*, met with two little Stones, with several Apostemes. And *Wierus* has observ'd little Stones in the Heart.

In *Novemb.* 1668. we dissected a Person in the public Theatre, of about five or six and thirty years of Age, who in his Life-time complain'd of many Heavinesses, and a long *Asthma*; in whose Heart we found an unusual sort of Body, white and firm, and truly nervous, which could not be crumbl'd between the Fingers, about a short span long, and about the thickness of the little Finger, cover'd with a peculiar Membrane, between which and the Body it self, were two Vessels swelling with Blood, reaching on the one side from the top to the bottom. The one, where it was larger and thicker, being solid without any hollowness, adher'd to the Ventricle it self. The other, forked, divided as it were into two Legs, which were hollow, with little winding Cells. One of which Thighs extended to the Pulmonary Vein, the breadth of two or three Fingers; the other to the *Aorta*-Attery. Such like, but lesser *Polypus's* we found in the Right & left Ventricle, in *Feb.* 1670. These Bodies hinder'd the free passage of the Blood through the Heart and Lungs, by which means the Lungs were very much swell'd; and when they were cut, a frothy kind of Liquor flow'd out of 'em. There were also in the Lungs little Veins, which in healthy People are hardly conspicuous, swell'd up in several places with Blood, to the thickness of a Lark's Quill. And such a sort of *Polypus*, *Bartholine* describes in his *Anat. Hist.* which was also found in a Heart: of the generation of which *Polypus's*, read *Malpigius* in a peculiar Treatise upon that Subject.

Vessels.

XII. There are four large Vessels adhering to the Ventricles of the Heart; the *hollow Vein*, the *Pulmonary Artery*, the *Pulmonary Vein*, and the *Aorta*.

The Right Ventricle.

XIII. ***The Right Ventricle is thinner, larger and bigger, but not exactly round, but almost Semi-circular, neither does it reach to the end of the Point.*** Therein the Veiny Blood, together with the *Chylus* brought from the *Subclavial* into the Hollow Vein, being admitted through the little Ear, is forthwith attenuated, and rendred spirituous, and so converted into true spirituous Blood; Being first prepar'd, exactly mingled with the *Chylus*, and moderately dilated in the Auricle.

The hollow Vein.

XIV. This Veiny Blood, either with or without the *Chylus*, the Ventricle receives out of the *Hollow Vein*, which is the largest Membranous Vessel in the whole Body, consisting of a simple and soft Tunicle, and in its progress, for its more security, wrapt about with the Coverings of the next parts. Into this Vessel, as all Rivers run into the Sea, so all the veins of the Body empty their Blood to be carry'd back to the Heart, to be there concocted and dilated anew.

This Vein is inserted or joyn'd with a large open Orifice to the Right Ventricle of the Heart, so that it cannot be separated whole from it.

The Treble-pointed Valves.

XV. To this Orifice grows a Membranous Circle, which is presently divided into three Membranous Valves, looking toward the inside, call'd vulgarly *Tricuspides*, or Treble-pointed, and that from their triangular Form, as some think; though they are neither of that Form, neither are they extended into three Points. Rather the Name is giv'n 'em from hence, because they have each of 'em three Fibres, or three or four little strings, by which they are fasten'd to the fleshy little Columns of the *Septum*. These Valves being open

in the Dilatation of the Ventricle, admit the Blood out of the hollow Vein: but falling, and ſhutting in Contraction at the ſame moment, prevent the influx of new Blood out of the hollow Vein into the Ventricle.

The Pulmonary Artery. XV. Which Blood is then forc'd out of the Right Ventricle into the Lungs through the *Pulmonary Artery*, which is another large veſſel annex'd to it at the upper part, which our Anceſtors erroneouſly call'd the Arterious Vein, though it be nothing like a Vein: as is apparent,

1. From its Subſtance; being a double, thick and firm Tunicle.

2. From its Uſe, which is to convey the ſpirituous and boiling Blood.

3. From its Motion; becauſe it beats like the reſt of the Arteries, as we find by the Diſſections of living Animals.

Sigmoid Valves. XVI. Cloſe to this Orifice are fix'd three membranous Valves, looking outwards, call'd *Sigmoides*, from their ſimilitude to a Greek *Sigma*, which was anciently like a Roman C. Theſe hinder, leſt the Blood forc'd to the Lungs, ſhould ſlide back again to the ſame Ventricle, by the depreſſion of the Lungs, and dilatation of the Heart. Through this Veſſel therefore the Blood is largely diſcharg'd out of the Right Ventricle of the Heart into the Right and Left part of the Lungs; of which the leaſt part is expended in the Nouriſhment of the Lungs; but the greateſt part being forc'd into the little Branches of the Pulmonary Vein, which are joyn'd with the Branches of the Artery by *Anaſtomoſes*, and diſpers'd through both Lobes of the Lungs, like a Net, together with the Branches of the Artery, is convey'd to the Auricle and Left Ventricle of the Heart, through the Trunk of the Pulmonary Vein.

The left Ventricle. XVII. The Left Ventricle of the Heart is narrower than the Right, but much more fleſhy, thicker, harder and longer; having a Cavity ſomewhat round, and reaching to the Point. In this the Blood being refrigerated by the Inſpiration of the Lungs, is again fermented, dilated, boiles, and is render'd ſpirituous, and acquires its utmoſt perfection.

The Pulmonary Vein. XVIII. And the Ventricle receives this Blood to be thus brought to further perfection, through the *Pulmonary Vein*, which is a large Veſſel deſcending from the Lungs, inſerted into the upper part of the Ventricle, and continuous to it, which was formerly, though erroneouſly, call'd the *Veiny Artery*; whereas it is no Artery, but a Vein; as is apparent, 1. From its ſimple and ſoft Tunicle, which is like other Veins. 2. From its Uſe, which does not afford a ſpirituous and hot, but a refrigerated and temperate Blood. 3. For that it does not beat like the reſt of the Arteries.

The Mitral Valves XIX. *To the Orifice of this Vein, are joyn'd two membranous Valves, call'd* Mitral, *becauſe that being joyn'd together, they ſeem to reſemble a Biſhop's Miter.* Theſe differ little or nothing in Matter and Form from the Tricuſpid Valves, and looking toward the inner parts of the Ventricle, prevent the reflux of the Blood out of that Ventricle into the Lungs. To that end, for their greater ſtrengthening, they are ty'd to flat fleſhy pieces, and long filaments, with two or three thick and fleſhy ſmall Sinews, or little Pillars, riſing upwards from the lower part of the *Septum*, which ſome believe to be Muſcles, and that the *Filaments* are *Tendons*.

The Aorta. XX. *The Blood perfected in this Ventricle is diſcharg'd into the* Aorta-Artery, *inſerted and continuous to it, being the Root of all the Arteries, except the* Pulmonary *and* Trachea, *being of a more ſolid and harder Subſtance, and furniſh'd with a double Tunicle, the innermoſt thicker, the outermoſt thinner, and a thin Membrane of the neighbouring Parts for its further ſecurity.*

The Half-Moon Valves. XXI. *At the Riſe of this Artery ſtand three Valves, extended outward, by the Ancients call'd* Semilunares, *as reſembling a Half-Moon, altogether like the* Sigma *form'd.* Theſe ſuſtain the violence of the Blood, ſtriving to flow back out of the *Aorta*.

The Bone of the heart XXII. *In ſome Brutes, eſpecially in Harts, there is bred of the Orifice of the* Aorta *harden'd, a little Bone that ſuſtains the Valves.* *Galen* makes mention of this Bone in ſeveral places. *Plempius* writes, That he has ſometimes taken ſuch a Bone out of the Hearts of Oxen. But he does not believe it to be any part of the *Aorta* turn'd into Bone, but a peculiar Bone; becauſe it is obſerv'd to be in the fleſhy Subſtance it ſelf of the Heart. *Nicholas Stenonis* writes, That he has not only obſerv'd it in larger Animals, but alſo in Sheep, and believes it to be nothing but a part of the tendonous Orifice turn'd

turn'd into a Boney hardneſs: *Bartholine* however met with one in the Heart of a Phthiſical Perſon, and aſſerts, that another was found in the Heart of Pope *Urban* the 8th. *Riolanus* reports, that there was a Stone found in the Heart of a Preſident, and of the Queen Mother; and boldly aſſerts, That it is not only frequently to be met with in the Hearts of Old Men, in whom he had obſerv'd it himſelf above thirty times; perhaps, becauſe *Riolanus* was more us'd to the Diſſections of Old Men than other Anatomiſts, who generally meet with the Younger ſort.

CHAP. X.

Of the Union of the Veſſels in the Heart of the Birth. See Figure 7. Tab. 9.

HOW the Blood is mov'd through the Heart in its Veſſels, in Men born, has been ſufficiently explain'd; but becauſe in the Birth, while it abides in the Womb, the Veſſels are ſomewhat otherwiſe diſpos'd, let us examine how the Work of Sanguification proceeds there.

The Motion of the Blood in the Birth.

I. *In the Birth, the Blood does not paſs out of the Right Ventricle of the Heart through the Lungs to the Left Ventricle, as in a Man born; neither is it fermented, concocted and dilated in both Ventricles, but in one. For that which is concocted and dilated in the Right, does not thence proceed to the Left, to be there dilated; and that which is dilated in the Left, was not dilated before in the Right.*

Double Unions of the Veſſels.

II. To this purpoſe there are double Unions of the Veſſels in the Birth, through which that Paſſage of the Blood is made, which in grown perſons are quite defac'd.

The Oval Hole.

III. *The firſt Union is made in the Heart by* Anaſtomoſis, *being a large and wide hole of an Oval Form, ſeated under the right Auricle, near the* Coronary, *before the hollow Vein, diſtinctly opens it ſelf into the right Ventricle*: Hence call'd the *Oval Hole*, by which is made the Union of the hollow vein, call'd the Pulmonary Vein.

IV. To this Hole next to the *Pulmonary Vein*, is annex'd a membranous thin Valve, but firm and hard, bigger than the Hole, hindring the reflux of the Blood flowing into the left Ventricle out of the hollow Vein.

Its Valves.

V. *The other Union is made about two Fingers Breadth from the* Baſis, *without the Heart, by a long Channel, by which the Pulmonary Artery is joyn'd to the Great Artery, which Channel has the Subſtance of an Artery, as alſo the ſame thickneſs and wide Cavity, and aſcends with an oblique aſcent from the pulmonary Artery to the great Artery, and diſcharges into the* Aorta *the Blood forc'd from the Right Ventricle of the Heart into the Pulmonary, ſo that it ſhould not fall into the Left Ventricle.*

The other Union.

But becauſe the heat of the Birth is like a new Fire, which begins firſt to be kindled by a little Spark, and ſo increaſes to a bigger Fire; hence it come to paſs that its Blood while it abides in the Womb, is not yet arriv'd to that degree of Heat, as to want Refrigeration, and the double Concoction of the Heart: for it requires not as yet that Acrimony which is afterwards neceſſary for a firmer Nutrition of the Body. Which is the reaſon that the Birth does not breathe in the Womb, and that the Lungs are idle and uſeleſs for a time, and remain thicker: by reaſon of which Denſity, there is no free paſſage through the Lungs for the Blood concocted in the Right Ventricle of the Heart, and thence forc'd into the *Pulmonary Artery*. For which nevertheleſs that there may be a way and paſſage open, the ſupream Creator ordain'd that Channel, through which that Blood ſhould be diſcharg'd out of the *Pulmonary Artery* into the *Aorta*, there being no more allow'd in the mean time to the Lungs, than what is requiſite for their Nouriſhment.

The Uſe of the Right Ventricle.

VI. *But leſt the Right ventricle of the Heart, wherein the more ſubtle, and ſpirituous Blood is made, ſhould remain idle for want of Matter; the Oval Hole is plac'd at the entrance into the hollow vein, to the end the Blood falling out of the hollow vein, ſhould diſcharge it ſelf, partly into the Right Ventricle of the Heart, partly through the ſaid Hole*

into the Pulmonary Vein, and ſo into the Left Ventricle.

And thus the Blood in the Heart of the Birth, is concocted or dilated only ſimply and once in either of the Ventricles, and that which is concocted and dilated in the Right Ventricle, is mingled in the great Artery with that which is dilated in the Left.

The Oval Hole is aboliſh'd in Children, when born.

VII. ***This Oval Hole which is wide in the Birth, being of no Uſe to Men born, becomes ſo cloſ'd and ſtopp'd up within a few weeks, that there is not the leaſt Figure of it that appears.*** For it is a very rare thing to find it pervious in People of ripe years, as *Pinæus*, *Marchettus*, *Riolan*, and *Bartholin*, and others have written that they have ſeen it: yet is it not to be ſeen in one of ten Thouſand. And moſt commonly it is ſo cloſely ſtopp'd up, that you would ſwear there was never any hole there. For it is ſo ſtopp'd up and conſolidated by the Valve aforeſaid, in a ſhort time after the Birth comes into the World, that there is no more paſſage to be ſeen, although in many people of ripe years, the ſame Valve, now fully corroborated, is ſo tranſparent, that it appears diſtinct from the reſt of the Subſtance of the ***Septum.*** And therefore what *Riolanus* writes, is moſt abſurd, and repugnant to Truth, That the *Anaſtomoſis* frequently, nay almoſt at all times remains open by means of this Hole.

The Channel alſo cloſes up.

VIII. ***In like manner the ſaid Channel, though it be very wide, and the Subſtance of it remarkably thick like that of the*** Aorta, ***yet after the Child is born, it dries and conſumes away in ſuch a manner, that there are not the leaſt Footſteps of it in people of ripe years.***

The foreſaid Unions of the Veſſels, for want of humane Birth, may be conveniently demonſtrated in Calves newly Calv'd, and Lambs newly yean'd.

CHAP. XI.

Of the Office or Action of the Heart.

The Opinions of the Ancients concerning the Seat of the Soul in the Heart.

I. PLato, Galen, *and ſeveral of the* Stoicks *aſſert, That the Heart is the Seat of the Iraſcible Soul.* But *Chryſippus*, *Poſſidonius*, and many of the *Ariſtotelians*, not only of the Iraſcible, but Concupiſcible Soul. From whom *Hippocrates* does not very much differ, while he alledges, That the Soul abides in the hotteſt and ſtrongeſt Fire; and plainly affirms moreover, That the Mind is ſeated in the Heart of Man. This was alſo the Sentiment of *Diogenes*, as *Plutarch* witneſſes; and of *Zeno*, according to *Laertius*. To which Opinion *Apollodorus* alſo ſubſcrib'd, as *Tertullian* teſtifies; and which *Gaſſendus* likewiſe, among the modern Authors, endeavors to prove. Nor do the Sacred Scriptures a little contribute to the confirmation of this Doctrine. Where we read, That *God is the Searcher of the Heart*; That *out of the Heart iſſue evil Thoughts*; That *Folly, Wiſdom, Judgment, Counſel, Repentance proceed from the Heart.* Whence the Prophet *David* thus prays, *Pſal.* 119. *Give me Wiſdom, and I will keep thy Law, and obſerve it with my whole Heart. Incline my Heart to keep thy Teſtimonies. The Lord hates the Heart which imagines evil Thoughts.*

Beſides this, they produce ſeveral Reaſons.

1. Becauſe the Heart firſt lives and moves, and laſt dies, and being wounded, the whole Structure falls.

2. Becauſe it is ſeated in the middle and moſt worthy part of the whole Body.

3. Becauſe this Bowel only makes the Blood and vital Spirit, and nouriſhes and enlivens every Part of the Body: and that the Soul abides in the Blood, is apparent from the Sacred Text, *The Soul of the Fleſh is in the Blood.*

4. Becauſe the Heart being out of order, the whole Body ſuffers with it; but when other Parts are vitiated, it does not neceſſarily die with them.

5. Becauſe the Brain, to which moſt aſcribe the Seat of the Soul, depends upon the Heart; and the Motion of the Brain proceeds from the Heart.

6. Becauſe a Part of the Brain may be corrupted and taken away, the Life and

The Office of the Heart.

and Soul remaining, but no part of the Heart, all whoſe Wounds are mortal.

7. Becauſe, although Perception, Thought, Imagination, Memory, and other principal Actions are perform'd in the Brain, it does not follow that the Seat of the Soul is in the Inſtrument by which thoſe Actions are perform'd. The Workman by the Clock and Dyal which he makes, ſhews the whole City what time of the Day it is, and numbers the Hours by the ſtriking the Bell; yet hence it does not follow, that he himſelf abides or has his fix'd reſidence in the Clock; 'tis ſufficient he affords the Clock what is requiſite for the performance of the Action, though he live in another place. Thus the Soul may operate indeed in the Brain, as in the Inſtrument, but may have its Seat nevertheleſs in the Heart. Hence *Picolomini* acutely alledges, That the Soul is ty'd to us upon a double Accompt. 1. By Nature, and ſo abides abſolutely in the Heart. 2. By Operation, as it ſends Faculties to the Inſtruments by means of the Spirits diſcharg'd out of the Heart; by the operation of which Faculties the Preſence of the Soul is diſcern'd. In the ſame manner *Avicen* will have the Soul with its Faculties abide in the Heart, as in the firſt Root, but that it gives its Light to all the Members. That is to ſay, that the Heart is the beginning of the Animal Faculties; but makes uſe of the Brain as the Inſtrument of Feeling; ſo that the Animal Faculty is radically in the Heart, but by way of Manifeſtation in the Brain.

And theſe and ſome others, like theſe, are the Authorities and Reaſons, wherewith ſome, going about to deſcribe the Office of the Heart, endeavour to defend their opinion, which *Carteſius* nevertheleſs moſt ſtrenuouſly oppoſes.

But they ſeem to be all out of the way, who going about to deſcribe the Office of the Heart, preſently fall a quarrelling about the Seat of the Rational Soul, and proſecute it with that heat, as if the whole Queſtion depended upon that Hinge. But we are going about to examine the Office of the Mortal Heart, not the Seat of the Immortal Soul.

The Office of the Heart.

II. ***Now the Chief and Primary Action of the Heart in the whole Body, is to make Blood, and by Pulſation to diſtribute it through the Arteries to all the Parts, that all may be nouriſhed thereby.*** This Office of Sanguification, the moſt ancient Philoſophers always aſcrib'd to the Heart. Thus *Hippocrates* calls the Heart the Fountain of Blood. *Plato*, in his *Timæus*, aſſerts the Heart to be the Fountain of Blood, flowing with a kind of violence. *Ariſtotle* aſſerts the Heart to be the beginning of the Veins, and to have the chief power of procreating Blood. But after them came *Galen*, the Introducer of a new Opinion, who excuſes the Heart from the Function of Sanguification, and aſcribes it ſometimes to the Liver, ſometimes to the Subſtance of the Veins, and ſometimes to both. *Veſalius*, *Jacobus de Partibus*, *Columbus*, *Picolomini*, *Carpus*, *Bauhinus*, *Joubertus*, and ſeveral others imitate *Galen* with great Applauſe, eſpecially thoſe who are meer Followers of the Flock that goes before; going not where they are to go, but where the *Galeniſts* go; and had rather admire *Galen*'s Authority, than enquire any farther into the Truth. But in this our Age, the ancient Truth, that lay long wrapt up in thick Clouds, again broke forth out of Darkneſs into Light.

For ever ſince the Knowledge of Circulation has illuſtrated the whole Body of Phyſick, it has been certainly found out, That the Office of Circulation agrees with the Heart alone, and that therein only this General Nutriment is made, by which all the Parts of the whole Body are to be nouriſh'd, and for that reaſon, that there is a perpetual Pulſe allow'd it on purpoſe to diſperſe that Nouriſhment, and communicate it to all the Parts.

This Sanguifying Duty the moſt Famous Philoſophers at this day allow the Heart; ſo that there are very few left that uphold the *Galenic* Sentence of the Liver any longer. Though *Swammerdam* has promis'd to reſtore the Liver to its former Dignity, but upon what Grounds, and with what Applauſe we longingly expect.

Gliſſon's *New Opinion.*

III. ***But*** Gliſſon ***revolts from both Opinions, as well the Ancient one, concerning the Heart, as the*** Galenic ***Opinion, concerning the Liver.*** Who finding that the Seed being conceiv'd and alter'd by the Heat of the Womb, the Vital Spirit, that lay aſleep, is rais'd up from power to act, and that then that Vital Spirit moves the Vital Juice in which it abides, every where; and alſo makes Channels and Paſſages for it ſelf through the Seminal Matter; moreover,

over, that Sanguineous Rudiments appear, before the Heart, Liver or other Bowels can be manifeſtly ſeen; from all theſe things he concludes, That the Blood is not generated and mov'd in the Heart, but that the Heart and Blood are generated by the Spirit, or vivific Juice which is in the Blood it ſelf. To which, he adds an Axiom, *Becauſe*, ſays he, *the ſame*, quatenus *the ſame*, *always operates the ſame.* And hence he concludes, *That the Cauſe that made the firſt Blood in the firſt Conception, the ſame, or at leaſt a Cauſe æquipollent to it, ought afterwards alſo to be eſteem'd the Fountain of Sanguification.* This Opinion he confirms with many ſpecious Reaſons, which I omit for Brevity's ſake.

The Reply to Gliſſon's Opinion.

IV. But we anſwer to the moſt Learned *Gliſſon*, That *the Vivific Spirit is the firſt Mover in the Seed; and that when it begins to riſe into Act, and enliven the Seed, ſo diſpoſes by its Motion the vital Juice, to which it adheres as to its Subject, that out of ſome of its Particles are made the Heart, out of others the Liver, out of others, the Veſſels, Membranes,* &c. *And ſo by that Motion they erect to themſelves a Habitation; the ſeveral and particular parts of which, according to the various Diſpoſition of the leaſt Principles, perform various and diſtinct Operations, over all which that Spirit preſides, as General Preſident.*

For enlivening all the Parts together, it excites every one to the Function properly allotted to them. Not that the Spirit performs the peculiar part of every one: but whatever Aptitude to act it bequeath'd to the ſeveral Parts in the firſt Confirmation, that Aptitude it preſerves by its preſence, without which they could perform no Operations at all. Therefore the Vivific Spirit, according to the Axiom fore-cited, always performs one and the ſame Action in the whole Body, that is to ſay, it enlivens. But it does not produce the Matter to be enlivened, without which nevertheleſs it cannot ſubſiſt, when the Conſumption of its Subject, that is, the vital Juice requires daily reparation. Therefore the ſeveral Parts enliven'd, generate that Matter by degrees, and by vertue of many and various Concoctions, and other preparatory Operations, which the Vivific Spirit cannot perform without thoſe Parts: For it could not *Chylifie* without the Stomach, nor *Sanguifie* without the Heart. And hence, tho' that Spirit be the general Life of the whole Body, without which nothing can be done, and which is preſuppos'd to abide and be in all and ſingular the Parts ſpecially operating, nevertheleſs, becauſe it cannot perform thoſe Operations without the ſaid Parts, it cannot be ſaid that it abſolutely performs thoſe peculiar Operations: but it is better, and indeed neceſſary to ſay, That they proceed from the Nature of the ſeveral living Parts. And ſo the Ventricle in reſpect of its proper Nature *Chylifies*, and the Heart only *ſanguifies*, and no other Parts of the Body can perform the ſame Actions, becauſe no others have the ſame Propriety of Nature. Falſe therefore it is, what *Gliſſon* ſays, That it is not the Heart, but this vivific Spirit, which he certainly preſuppoſes to be in the Blood, that generates other new Blood in the Blood it ſelf, and is the Cauſe of the Motion of the Blood. That the firſt is untrue, is apparent from hence; for that if the Blood were generated out of the Blood exiſting in the Blood, then the Blood being out of order, and diſtemper'd, there will be a ſtop to Sanguification. But the contrary appears in Perſons Scorbutic, and labouring under Cachexies; in whom Sanguification nevertheleſs goes forward, nay the Corruptions of the Blood are mended and corrected by the benefit of the Heart; which otherwiſe could never be corrected by reaſon of the diſtemper of the Blood. On the other ſide, if the Heart be out of order, preſently there is a ſtop to Sanguification, and the Blood it ſelf is deprav'd. The latter is falſe, as appears by the Diſſections of Living Animals: For if the beginning of the *Aorta-Artery* be ty'd with a ſtring near the Heart, preſently all Motion of the Blood ceaſes in the Arteries; which would ſtill continue, if it contain'd within it ſuch a Spirit-mover of it ſelf, and had not its Motion from without: but cut the ſtring, and preſently the Motion of the Heart returns by virtue of the Pulſe of the Heart. The ſame is alſo manifeſt in faint-hearted perſons, who, at the time of letting Blood, fall into a Swoon upon the Surgeon's pricking the Vein; nor can you hardly perceive their Heart to beat; ſo that there is little or no Blood mov'd through the Veſſels, nor will the Blood flow from the ſmall Wound; but when the Patient comes again to himſelf, and that the Heart begins to beat, preſently the

the Blood moves again, and ſpins out at the little hole made by the Lancet.

Whence it appears, that the Blood is not mov'd or generated by the Vivific Spirit which is in the Blood, but by the Heart; and that the Vivific Spirit abiding in all the Parts of the Body, does only revive the Parts; and that thoſe enliven'd Parts, according to the variety of their ſeveral Diſpoſitions, act ſpecially, and after various manners upon the Matter to be enliven'd.

Whether any vivific Spirit be in the Blood.

V. Moreover I think it requiſite, more accurately to examin, *Whether any Vivific Spirit, as* Gliſſon *preſuppoſes, be in the Blood?* I know indeed, That the *Vital Spirit*, generally ſo call'd, is generated in the Heart, that is to ſay, apt to be enliven'd, and to promote Sanguification by its Heat; yet I cannot believe, that this *Vivific Spirit*, that is already actually living and enlivening, is mingl'd with the Blood, when that Spirit is of a higher Order, and only abides in the *Germen*, and Bloſſom of the Seed, and the neceſſary primogenial moiſture of the Parts themſelves of the Body, and muſt be rouz'd into Action, by the flowing in of the hot vital Spirit: in regard the Blood it ſelf is not yet a Part of the Body, not enliven'd, but to be enliven'd, when it ſhall be aſſimilated to the Parts.

A Similitude.

VI *Thus an Artiſt, who has made a Clock, does not move the Wheels, nor ſhew the Hours, but he makes the Clock, which could never move the Wheels, nor tell the Hours, unleſs the Artiſt had made that Engine, and bequeath'd ſuch an Aptitude to it, which afterwards he preſerves to it alſo: So the Vivific Spirit, although at the firſt Creation of the Parts, it made the Heart, and endu'd it with a Sanguifying Aptneſs; which afterward it alſo preſerves therein by its preſence; yet is it not that Spirit, but the Heart which muſt be ſaid to Sanguifie.*

As to the firſt Principles of the Blood, which, as *Gliſſon* ſays, are obſerv'd at the firſt time of Conception, before the Heart appears; I ſay, that thoſe Rudiments are alſo produc'd by the Heart; for theſe Rudiments are not to be ſeen till the leaping Bubble begins to move, which is the firſt beginning of the Heart: and although the whole Structure of a live Heart, does not appear to the Eye; yet that it is there, and generates the firſt Principles of the Blood, the Effect teaches us. I wonder indeed that *Harvey*, who aſſerts the Blood to be made before other things, did not take notice of this, eſpecially writing as he does, *That at the ſame time*, that the Blood begins to be diſcern'd in the Egg, that its Receptacles, the Veins, and beating Pulſe manifeſtly appear. Whence it is ſufficiently apparent, That the Blood is not to be diſcern'd, but with the beginning of the Heart; which aſſoon as it begins to act, makes the Blood; and then the ſame Cauſe acting that made the Blood, afterwards continually generates the Blood, as being the only Fountain from which the Blood perpetually ſprings.

There remain Three other Arguments of *Gliſſon*, which he thinks to be *Herculean*.

Firſt, ſays he, *The Heart borrows all its vital Heat and Activity from the vital Blood contain'd in its Ventricles, and diſtributed into its Subſtance through the Coronary Arteries, without which Heat and Vitality, it would grow num and languid.* Hence he concludes, That the Heart is mov'd, nouriſh'd, and lives by the Blood; but that the Heart it ſelf neither moves or generates; and this he demonſtrates by the Example of a Heart pluck'd out of a Living Animal, into the Ventricles of which, as yet beating, if any Liquor be infus'd, it is not chang'd into Blood. An egregious Compariſon of the Operation of a Heart contain'd in a ſound and healthy Creature, with its Operation when pull'd out of an Animal, and utterly debilitated: And indeed as baſe a Compariſon of any raw Liquor infus'd into the half dead Heart cut out of a Living Creature, with the *Chylus* prepar'd by various Concoctions, for Sanguification; and naturally diſcharging it ſelf into a ſound beating Heart. But if the Heart borrows Heat and Activity from the Blood, what's the reaſon that the Heart being diſtemper'd by ſome malignant Vapour, and beating little or nothing, preſently all the Sanguineous Parts are refrigerated; whereas there is a ſufficient quantity of good Blood in the Veſſels, able both to warm thoſe Parts, and to flow into the Heart it ſelf? But we find this ſudden Refrigeration in the beginning of the Fits of Agues, in Frights and *Syncopes*, &c. Certainly no body will believe otherwiſe, but that this happens meerly becauſe the Blood receives its Heat and Motion from the Heart; and when that ceaſes to move, then the Blood of the reſt

of

of the Parts, becomes depriv'd of Heat and Motion, and conſequently to be refrigerated. Beſides, the Heart does not ſimply languiſh by reaſon of the failing Influx of the Blood into the Ventricles, which occaſions a defect of Heat and Vital Spirits, but for want of convenient Matter, out of which to generate Vital Spirits; and ſo to make convenient Nouriſhment, both for it ſelf, and the whole Body.

His Second Argument is taken from the *Colour*: For he ſays, *The* Chylus *cannot obtain a red Colour from the Heart, and conſequently be chang'd by it into Blood; becauſe the Blood it ſelf is much redder than the Heart, or Subſtance of the Heart; and that therefore the Heart is not ſufficiently Aſſimilar to the Blood, as to perform that Office; ſeeing that every Part that is apt for Sanguification, ought to be like the Blood.*

And Laſtly, He adds, *How ſhould any thing act beyond the Sphere of his Activity, and communicate that to another, of which it is deſtitute it ſelf? Therefore becauſe the Heart, Liver and Veins, are paler than the Blood, how ſhould they contribute to it a more lively Colour than their own?* But here *Gliſſon* ſeems to have forgot himſelf: For a little before, he ſaid, That frequently by Heat and Motion, Colours from white and pale, become more ruddy; which is apparent by the Boilings and Bakings of Fruit, Fleſh, and by a Thouſand other Experiments: And now he will not allow of a red Colour from Motion and Specific Heat, but from a like Colour: Which how ill they cohere, is apparent. Fruits, Fleſh and other Subſtances bak'd in an Oven, acquire a ruddy Subſtance. The Juice of the larger *Conſound*, digeſted in Horſe-dung for ſeveral days, puts on a ruddy Colour; whereas neither the Oven nor the Horſe-dung are red. The Stomach, by a Specific Concoction, gives a white Colour to the *Chylus*, which it has not it ſelf. The Choler in its Veſicle, acquires a green Colour by overmuch Concoction and ſtay therein, and is naturally of a yellow Colour; whereas neither the Liver, or the Gall-Bladder, are green or yellow. Many times ſalt, ſharp, and greeniſh Humors diſtil from the Brain, which is white it ſelf, and without any Greenneſs, Saltneſs or Acrimony. In a virulent *Gonorrhœa*, greeniſh and yellowiſh Seed flows forth; whereas the Spermatick Veſſels have no ſuch Colour. Certainly they are mightily out of the way, who attribute to Colour that ſame Efficacy which is to be aſcrib'd to the Heat, and ſpecific Concoction and Mixture proceeding from the Propriety of the Part: which Colour does not proceed from the Similitude of the acting Part wherein it is concocted, but from the Heat acting ſpecifically in that Part, according to the ſpecific Conſtitution, Temper, and Formation of the Parts. And hence it is, that the Heat of the Stomach extracts a white *Chylus* out of the Aliments, and why the Heart changes the *Chylus* into white Blood. Laſtly, If the *Chylus* gain only a red Colour from the Redneſs of the Blood, I would fain know what it is, that in the firſt Conception changes the white Seed into red Blood.

His Third Argument is taken from *Concoctions*: *For*, ſays he, *Natural Bodies, as much as in them lies, labour to aſſimilate to themſelves all other Bodies that are within the Sphere of of their Activity; and hence the Heart, ſhould it betake it ſelf to the Function of making Blood, would bring the* Chylus *to the ſimilitude of its own Subſtance, and there ſtop, and never proceed to induce the Form of Blood.*

But wherefore does not *Gliſſon* ſay the ſame of the Stomach and Liver? Why do not theſe Bowels change the Aliments into a Subſtance like themſelves, and there ſtop; but rather into a Subſtance quite contrary, that is, white *Chylus*, or yellow and green Choler? Which, if it be allow'd them to do, for the common Good of the whole, why ſhall the Generation of a diſſimilar Subſtance be allow'd the Heart for the benefit of the whole? But the Learned *Gliſſon* does not ſufficiently diſtinguiſh between public and private Concoctions; nor does he take notice, That in public Concoctions, the Matter is prepar'd for the Nouriſhment of the whole: in private Concoctions, the alteration of that prepar'd Matter, is made into the Subſtance of the ſeveral Parts. And hence it is neceſſary for thoſe Bowels that ſerve for ſecond Concoctions, that they ſhould make the Nutritious Matter to be prepar'd for the whole, not like to themſelves, but ſuch out of which all and every the Parts may aſſume and aſſimilate to themſelves ſomething

thing convenient and proper for themſelves. And ſo likewiſe thoſe Bowels themſelves are nouriſh'd by a private Concoction, with that common Aliment, which they have prepar'd for the whole Body, that is to ſay, the Spirituous Blood; and out of that aſſimilate to themſelves convenient Particles, and then ſtop in that firſt Concoction, while in the mean time, they proceed farther in the publick Concoction.

And thus the foreſaid new Opinion ſeems to be ſufficiently refuted, notwithſtanding *Charleton* has ſhew'd himſelf ſo obſtinate in its Defence. But in regard that *Gliſſon* uſes the ſame Words and Arguments, there is no need of any farther Refutation of him, although he aſſert the ſole quantity of the Blood to be the occaſion of its Motion, and therein ſeems to differ ſomething from *Gliſſon*.

CHAP. XII.

Of the Blood, Vital Spirit, and Nutrition.

The names. I. *THE Blood is call'd by the* Greeks, αἷμα, *by the* French, du Sang, *by the Italians*, Sangue, *by the Germans*, Blut; *by the Engliſh*, Blood; *and by the Low Dutch*, Bloet; *and which is chiefly to be admir'd at, there is no Synonimous Word by which that Humor may be abſolutely ſignify'd. Among the* Latins *indeed the Word* Cruor *is frequently us'd; but that Word does not abſolutely ſignifie* Blood, *but only the Blood which flows from Wounds and Ulcers; or corrupted Blood, or ſuch as remains in the Veſſels after Death. So likewiſe* Θρόμϐος *in the* Greek, *and* Grumus *in the* Latin, *ſignifies* Clotted Blood.

Its Definition. II. *Now Blood is a red Juice made in the Heart, out of the* Chylus, *for the nouriſhment of the whole Body.*

Its Subſtance. III. *Its Subſtance conſiſts of two ſeveral Juices, by means of the* Serum, *ſo united in the* Serum *it ſelf, through ſeveral Concoctions of the Bowels, as to become one Bloody Maſs together.*

Its Juices. IV. *One of theſe Juices is Sulphury, though* Malpigius, *not dreaming of Sulphur, calls the ſame Juice every where Fatneſs; the other, Salt: the one ſomewhat fatty, oyly and viſcous; the other, altogether different from all manner of Fatneſs.* I call 'em Juices, ſo far as Sulphur and Salt in Fuſion, concur to the Maſs of Blood. And therefore in diſſolution, they cannot be well mingl'd without loſs and tumult, (for Fat with watery Salt never mixes well) unleſs ſome *Mercury* intervene, ſo familiar to the Nature of both, that both may be exactly mix'd as well with it, as in it. This *Mercury* is the *Serum*, as in which the more watery Particles of both the ſaid Juices are diſſolv'd and mix'd by Concoctions. And hence that is conſtituted, not only out of the Watery part of the Elements alone, but alſo out of ſome Sulphury and Salt particles melted therein by Concoction; and ſo it partakes of a certain middle Nature, ſo that therein there may be a convenient Mixture, and, as it were, a union of the Sulphury and Salt Juices. Theſe Particles are diſcern'd by the Saltiſh Savour of the Sweat and Urine, the Sulphury, by the Smell of both: the one, by the Salt which is ſeparated from the Urine by Chymiſtry; the other, for that ſtale Urine being heated at the Fire, the exhaling Vapour preſently burns when it comes near the Fire. And therefore it is requiſite that the ſaid *Serum* be mix'd in a ſufficient quantity, and well concocted with the reſt of the Juices. For if it be too little, or none at all, the active Principles, that is to ſay, the Salt and Sulphury Juice, cloſe too ſtrictly together, and too vehemently exagitate and combat one with another, and in that mutual Conflict waſte and corrupt one another: whence the Body, either depriv'd of Nouriſhment, conſumes away, or elſe upon the corruption of the Blood, falls into Diſeaſes, and dies. But if either a too watry *Serum*, or over-raw abound, then the ſaid active Principles are too much eloin'd and ſeparated one from another, and their Combination becomes too looſe, ſo that they do not ſufficiently agitate each other; and hence the Blood being over-moiſt, and ſubject to Corruption, the whole Body that is nouriſh'd with ſuch Blood, grows weak and infirm.

Now that the Blood conſiſts of theſe Principles, is eaſily demonſtrated: For that Sulphur is in it, the many oily, ſweet, fat and ſulphury Nouriſhments that we uſe, ſufficiently declare; out of which, nothing elſe but ſomething Sulphury can be extracted by the Concoctions of the Bowels, and mix'd with the Blood. And this farther alſo, for that we find, that the moſt fat and ſulphury Parts of the Body are generated out of the Blood, which receive their Softneſs, Oilineſs and Tenderneſs from Sulphur. That there is Salt likewiſe in it, is apparent from the Salt-Meats which we feed upon, from the Salt which is extracted out of the Blood by Chymiſtry, and from the Salt which is in the Urine, and is ſeparated from the Blood, together with the ſuperfluous *Serum*. And that the *Serum* is in it, is viſible to the Eye. There are ſome alſo that add Earth to the other Principles: but ſeeing that is nothing elſe, but the remainder of thick Salt, very crude, and hard to be diſſolv'd, it ought not to be allow'd for a peculiar Principle, as being that which cannot be melted and diſſolv'd by Concoction, but by a long and vehement Heat, like another crude, tartareous Salt: as is manifeſt in Bricks made of Earth, and bak'd in the Kiln; for the Bricks next the Fire, through the vehemence of a continu'd Fire, melt, and run like thick Glaſs.

In this mixture of a Sulphury and Salt Juice in the *Serum*, the Sulphury Juice contributes a ſtronger and ſwifter Activity, but the Salt Juice conſtitutes the primary Maſs: as that which being of a more fix'd Nature, hinders the eaſie diſſolution of the Sulphury Juice, mix'd and blended with it, and ſo retards the diſſolving of the Sanguineous Maſs, and reſiſts Corruption, Stench, and Inflammation; and being prone to Fixation, thence it is the Cauſe that the Blood being infus'd into the Subſtance of the Parts, becomes a good part of it coagulated therein, and adheres, and is aſſimilated to it.

A Doubt. Here ariſes a notable Doubt to be conſider'd: *Seeing theſe fat or oily and ſulphury Parts of the Blood, are hotter than the others, and ſo ſeemable to promote the Salt parts to a ſtronger Activity, how it comes to paſs, that in fat People, in whom the ſulphury, oily Parts abound in great quantity, there happens leſs Agility of the whole Body, and leſs Activity of the Animal Spirits, but that they are generally ſloathful and ſleepy, and more troubled with Drowſineſs, Apoplexies, and ſhort Breath than leaner People?* This comes to paſs, becauſe that in ſuch People the oily ſulphury Particles of the Blood are too much abounding above the Salt, and too much enfold and blunt them with their greaſie Oilineſs, ſo that they cannot boil, be attenuated, and be made Spirituous; and hence they are leſs fit for the Generation of Animal Spirits in convenient and ſufficient quantity, ſo that the Animal Operations grow dull and heavy, and ſoporiferous Effects prevail. Moreover, the Heat of the Sulphury Particles themſelves aſſwages, and loſes its Vigor, unleſs there happen an Effervеſcency in the Blood by means of the ſharp ſalt Particles, and through the ſtronger and ſmaller Particles among themſelves, a fiercer Heat be rais'd. Which Fermentation is prevented, if the oily Particles too much exceed the ſalt. Here it may be objected, That in Agues, the ſulphury Heat predominates, and yet the Animal Actions are not always dull and numm'd in ſuch Perſons. Which comes to paſs, becauſe that in ſuch Perſons the ſulphury and oily Particles of the Blood do not exceed nor ſtupifie the Salt, with their Oilineſs and Quantity, but by their Heat and Motion ſtirring up their Acrimony to more vehement Action, produce an Effervеſcency either too ſtrong, or vicious and Aguiſh.

VI. But to return to the Buſineſs: *Out of the Sanguineous Maſs, by convenient Concoctions and Fermentations of the Bowels, double Spirits are rais'd; that is to ſay, Sulphureous and Salt; the one ſweetiſh, and the other ſowr; both very ſubtil and thin, and confus'd together, and yet one more volatile than the other; like the Sulphury Spirits in Oils chymically extracted out of Vegetables; and the Salt Spirits Chymically drawn from Salts and ſalt things.* *Double Spirits.* But that the Sulphury Spirits are more thin and volatile, is apparent in the Diſtillation of Vegetables; for they are firſt of all and moſt eaſily ſeparated, and aſcend the Alembick, unleſs too much perplex'd among the Salt, or being leſs attenuated by them, by reaſon of their Oilineſs; but the ſalt Spirits aſcend laſt, and with more difficulty; whoſe Acrimony the Taſte diſtinguiſhes from the Sweetneſs of the Sulphur.

But

But the foresaid Spirits of the Sanguineous Mass, out of which they are rais'd by Fermentations, are mingled with it, and carry'd forthwith to the Heart, and there being often attenuated, and dilated, are so exactly united, that they wax as it were one Spirit, which we call *Vital.*

Vital Spirit.

VII. ***Now the Vital Spirit is the most subtil and efficacious Part of the Blood, generated out of its Sulphury and Salt Particles, dilated by the Fermentation of the Heart.***

I say, the most subtile and efficacious Part of the Blood, that is to say, that which is rais'd out of its Sulphury and Salt Particles: for every thin and vaporous Substance, as that which is raised out of the serous part of the Blood, is not so be call'd a Spirit; because it is no efficacious part of the Blood, though sometimes less to be discern'd than the effectual Spirit it self: but that which through the copious admixture of it self, breaks the efficacy of its Spirits, and withstands their Agility.

When the Blood slides into the Heart, presently the frame and composure of the whole Liquor is dissolv'd, and the Spirituous Particles, the Bond of mixture being loosen'd, are exactly united together, and endeavour to expand themselves every way, but being restrain'd by the Vessels on the inside, they are mix'd with the other Liquor, and so burst forth into the open Tubes or Channels of the Arteries; through which, together with the Blood, they are pour'd forth over the whole Body, with the Blood and *Effluviums* of Heat.

Whether this Spirit be different from the Blood.

VIII. Now some there are, who with *Argenterius*, stifly deny this Spirit different from the Blood, to be in the Blood; though others with no less heat assert it. But this Contention seems easie to be compos'd, if we allow it to be the most subtile part of the Blood free'd from the thicker Matter, and exalted to an extraordinary Thinness; mix'd indeed with the whole, but easily separable from it; for that the perfection of the Blood consists in its Mixture, which without this Spirit would be only a crude and unprofitable Humor. In like manner as in Wine, the Spirit gives the Wine its perfection, and is the subtilest part of it; and by how much the Spirit is better, by so much is the Wine better: Yet this is separable by Chymistry from the Wine; but then the remaining Substance of the Wine becomes a crude, watery and unprofitable Liquor. And therefore the foresaid Question may be thus decided: If we mean good and perfect Blood, then it may be well said, that the Vital Spirit is in the Blood, and that it is not different from it, as being the most subtile part of it rais'd out of it self, which by its presence constitutes the perfection of the Blood. But if we mean Blood simply so call'd, as being that which is dissipated from the Blood, the Blood remaining, such as is to be found in dead People, which is not perfect, because there is no volatile Spirit remaining therein; then the Spirit may be said to be different from the Blood, or to be generated in it, the Blood still existing; which moreover were it in it, would predominate in it, and agitate the thicker Particles of the Blood one with another. But when, as *Aristotle* witnesses, nothing is agitated or mov'd by it self, it may be well said, that the other thicker particles of the Blood are not mov'd by themselves, but by another Mover, that is, the Spirit; which nevertheless is nothing else but a part of the Sanguineous Mass exalted to Spirituosity.

Here perhaps some will object, If this Spirit agitates other Particles of the Blood one with another, then the Blood contains in it self the Cause of its own Motion, and is not mov'd by the Heart. I answer, That the Motion of the Blood is double; one circulatory, which without doubt proceeds from the Heart; by which Motion, being in good part spiritualiz'd, it is carry'd through the Arteries to all the Parts of the Body. The other Fermentaceous, which is made by this Spirit, by which the least Particles of it are agitated one among another, while this Spirit passes through them like a Ferment, and divides 'em one from another; which vehement Fermentaceous Motion is observ'd in the *Crisis's* of Fevers, and the Emotion of the Flowers. But this Motion also proceeds from the Heart, so far as it continually begets this Spirit, by dilating the Blood, mixes it with the Blood, and quickens it by its Motion into Act; so that the Motion of the Heart ceasing, this also ceases.

The Heat of the Blood.

IX. ***This Vital Spirit, while it always endeavors to fly away by reason of its extraordinary Volatility, continually agitates the other thicker Particles of the Blood, that retard it, and re-assume its flight, and by them shaken after a various manner, and by rea-***

ſon of way deny'd it, often beaten back again, by which means it divides them one from another, conquers, ſubtilizes, and detains them in a continual Fermentative Motion; from which Motion and Agitation of the ſubtile Matter, proceeds Heat; which being moderate in a moderate Agitation, ſmall in a ſmall one, and violent in a violent Agitation; hence it happens, that the Blood, according to the variety of this Agitation, which may happen and alter upon divers Accidents, becomes more or leſs hot.

By this Motion thus ſtirr'd up by the Spirit, the Blood is not only preſerv'd in its Heat and perfect Soundneſs, that is, by the bond of exact Mixture; but is alſo render'd fluid, thin, and apt for Nouriſhment, which depriv'd of that Motion and Spirit, grows thick, corrupts and grows unprofitable. The ſame Spirit alſo contributes ſuch a Thinneſs of Parts to the Blood, as to be able to paſs the moſt narrow Paſſages, and to be convey'd to any Parts whatever; all which Parts this Spirit quickens to their ſeveral Functions; and by its continual Agitation and Heat thence proceeding, continually waſtes and diſſipates the more fluid Particles of the Parts, and continually repairs, and as often increaſes them by means of the Blood.

The Temper of the Blood.

X. *But the Blood, as alſo the Vital Spirit rais'd out of it, if it conſiſts of the two Principles, Sulphureous and Salt mix'd together, and equally agreeing in Strength; then is the Blood beſt, and well temper'd according to Nature.* But as the Force of theſe Principles exceeds one another, it is colder or hotter, and its Temper varies according to the ſtrength and prevalency of the Principle. I ſay, *Colder*, not that any cold Quality proceeds from Salt, or from a ſalt Spirit, as from its proper Subject; but becauſe while that predominates, the Sulphury Spirit is more obtunded and fix'd; whence happens a weaker Agitation of the ſmall Particles one among another, and conſequently a leſſer actual Heat. And another Reaſon, why Salt and its Spirit may be call'd *Colder*, is, becauſe that being caſt into the Fire, it only crackles; but does not flame out like Sulphur, or a Sulphureous Spirit.

The quantity and quality of the Spirits various.

XI. *Now out of the Blood thus compos'd of the ſaid Principles, ſometimes more, ſometimes fewer Spirits are rais'd. For if the Blood to be rarify'd in the Heart, be well concocted in the other Bowels, and prepar'd for Fermentation, and as I may ſay, brought to full Maturity; then there happens a right Fermentation or Dilatation in the Heart, by which a convenient quantity of Spirits is rais'd up with a moderate Heat; but if ill prepar'd and raw, then is the Effervescency leſs, and the Dilatation more difficult; and fewer Spirits riſe, and hence proceeds a cold Temper of the Body. If overmuch concocted, and that the Particles either Salt, or Sulphureous, or both, are too much attenuated; then the Dilatation is overmuch in the Heart, and the Spirits are over-ſharp and hot; and hence proceeds a hot Temperature, Corruption of Humors, Inflammations and Fevers, eſpecially if the Sulphury Spirits prevail above the other.*

An Error concerning the Spirits.

XII. *By the way, we muſt take notice that they are in a very great Error, who beſides the Principles conſtituting the Eſſence of the Blood in Mixture, add another Spirit, and aſſert a neceſſity for it to concur and be mix'd with the Salt and Sulphur in the* Serum. Whereas this Spirit of which they ſpeak, is not any thing peculiar concurring to the making of the Blood; but only a thin and ſpirituous Vapour, attracted out of the Salt and Sulphur it ſelf, by force of the Heat; as is perform'd by Chymiſtry in other Things: For though all Bodies are compos'd of Salt and Sulphur, as their Principles, united by the Aſſiſtance of *Mercury*; yet in regard that Salt and Sulphur are not Bodies altogether ſimple and equal, but compos'd of unequal Particles; hence the Bodies that are compos'd of thoſe Principles, conſiſt of unequal Particles, ſome thicker, ſome thinner, others more or leſs fix'd, and others more or leſs fit for Fuſion and Attenuation: For the Heat acting upon Bodies compos'd of theſe Principles, diſſolves firſt of all and more eaſily the thinner and leſs fix'd Particles, attenuates and renders them Spirituous, frees them alſo from the thicker Particles, and by means of the thicker Particles, agitates and moves them; and thoſe Spirituous Particles ſo attenuated, are call'd *Spirits*, as being endu'd with an extraordinary

extraordinary Tenuity and Mobility. Not that they are any thing different from Salt or Sulphur, concurring to the compoſition of the Mixture; but only ſome thinner Subſtance melted, attenuated and extracted by the Force of Heat, out of the ſame Mixture, which, upon the abſence of that Heat, again condenſes, and is quietly united as before, with the other thicker Particles not yet brought to Fuſion.

An Error concerning Air.

XIII. Nor are they leſs in an Error, who hold, *That there is a copious Quantity of Air mix'd with the Blood, as being neceſſarily requiſite to its Perfection.* Which Air they pretend, is mix'd four ways with the Blood. 1. As being mix'd and ſwallow'd with the Meat chaw'd in the Mouth: with which Nouriſhment it is ſo united in the Stomach, that at length entring the Region of the Heart, it is incorporated with the Blood. 2. By entring the Maſs of Blood through the Pores of the Skin. 3. When it is not a little mix'd with the Blood by the drawing in of the Breath, haſtning through the Lungs to the Left Ventricle of the Heart. 4. When by the ſame breathing in of the Air, it is carry'd to the Veſſels and Ventricles of the Brain. But if the Air be neceſſary to compleat the perfection of the Blood, then ought it always neceſſarily to be mix'd with it; but no Air can come at the Birth included in the Womb and its Membranes, and yet the Blood bred therein is no leſs ſound and perfect, than in thoſe that being born, both breath and ſuck in the Air.

The Original of the Principles of the Blood.

XIV. Here it may be queſtion'd, *Out of what things the ſaid Principles are extracted?* I anſwer, From the Aliments which contain both Sulphur and Salt in themſelves; and conſiſt of them mix'd and concocted after a Specific manner. Yet ſome are more, others leſs Spirituous, and hence ariſe variety of Qualities; which is the Reaſon, that ſome Nouriſhments agree better with hot, others with cold Conſtitutions.

But, to the end theſe Principles may be extracted out of the Aliments, and that Blood may be made out of 'em, it is requiſite that the Nouriſhments be prepar'd after another manner; that their firſt Mixture may be altogether diſſolv'd, and the latent Sulphureous and Salt Particles be exalted to Fuſion, and a more extraordinary Tenuity; ſo that being freed from their firſt Union, they may be again mingl'd after a new manner. To this purpoſe, beſides their Diſſolution by Cookery and Dreſſing, being admitted into the Body, in the firſt place thoſe things that are hard, are bruis'd and ſoften'd by the Teeth in the Mouth, and being prepar'd by the admixture of the Spittle, are ſwallow'd down into the Stomach. In the next place, they are farther fermented and diſſolv'd after a ſpecifical manner in the Stomach. 3. The more profitable *Chylus*, and more diſſolv'd Particles, are ſeparated from the thicker Particles by another peculiar Effervescency, and are yet more diſſolv'd and attenuated in the Milky Veſſels, and many Kernels of the *Meſenterium*, and by the Commixture of Lymphatic Juice; and theſe being mixt with the Veiny Blood, and carry'd to the Heart, are therein dilated; and ſo being united with the reſt of the Blood, become perfect Blood. But when they are the firſt time dilated in the Heart, it is not a Spirituous Blood that is preſently made out of 'em, but a thicker and cruder Blood, which is mix'd with the reſt of the Blood ſeveral times circulated through the Heart, and by that means render'd very Spirituous, and by frequent Circulations and Attenuations in the Heart, render'd ſtill more Spirituous.

The Chylus paſſing thro' the Heart, ceaſes to be Chylus.

XV. In the mean time, certain it is, *That the* Chylus, *paſſing through the Heart, and therein dilated, loſes the Form of* Chylus, *and at the very ſame moment aſſumes another, that is to ſay, the Form of Blood.*

Whether the whole Chylus be chang'd into Blood.

XI. But here ariſes a weighty Queſtion; *Whether the whole* Chylus *in its paſſage through the Heart, loſes altogether the Form of* Chylus, *and aſſumes the Form of Blood in ſuch a manner, as that no Part of it remains* Chylus? This Doubt was ſtarted by *Gualter Needham*, who ſays, That the *Chylus* dilated in the Heart, remains a conſiderable part of it actually *Chylus*, and that it circulates through the whole Body, being mix'd with the Blood; and is again ſeparated from the Blood in ſeveral Parts for private Uſes, eſpecially in the *Amnion* and Breaſts.

The Proof of the former Opinion.

XVII. This Opinion of his, he proves from hence, *For that frequently crude and indigeſted* Chylus *has been drawn from the Arms of ſuch as have been let Blood.* The ſame

ſame Opinion alſo, the Obſervances of other Phyſitians ſeem ſtrongly to confirm; of which *Bauſchius* has collected ſeveral in his *Germanic Ephemerides*. 1. Of a Girl, afflicted with a continual Fever, whoſe Blood, at three ſeveral Blood-lettings, appear'd Milky. 2. Of a ſick Patient, out of all whoſe Veins, when open'd, there always iſſu'd forth white Blood. 3. Of a certain Virgin, who, upon a Suppreſſion of her Courſes, after ſhe had eaten her Breakfaſt about Seven a Clock, was let Blood at Eleven, and the Blood that came from her, was purely white; and being warm'd upon the Fire, harden'd like the White of an Egg. 4. Of an Apothecary of *Cambray*, who, being prick'd in the Arm, the Blood look'd red, as it came forth; but was white in the Porringer. 5. Of a certain Perſon troubl'd with the Itch. 6. Of a Woman that gave Suck, that lay ill of a Malignant Fever. 7. Of a Woman with Child, ſick of a Fever. 8. Of another Woman with Child: And, 9. Of a Maid that was troubl'd with a Suppreſſion of her Courſes; from all which Perſons, upon their being let Blood, there flow'd a white Liquor together with the Blood. And *Regner de Graef* mentions two Stories of white Blood ſeen by himſelf.

Its Refutation. XVIII. But though ſuch a long *Series* of Obſervations ſeems to confirm *Needham*'s Opinion, yet becauſe thoſe Examples are quite from the Matter, it is impoſſible they ſhould be able to ſupport it: For all thoſe Caſes concern unhealthy Bodies only, from whom a whitiſh Matter iſſu'd forth together with the Blood. Concerning which Matter, there has been a ſharp Diſpute between the Phyſicians to thoſe Patients, whether it is to be call'd *Flegm* or *Chylus*; whether Milk or Matter; and many uncertain Conjectures have been made about it. When as it is well known by daily Practice, that by reaſon of ſome certain Infection of the Blood, proceeding from the bad concoctions of the diſeaſed Bowels, many times upon opening a Vein, the Blood will look ſometimes whitiſh or yellowiſh, and ſometimes of another Colour. Moreover, if any thing of a *Chylus* ſhould be mix'd with it, and circulate with it, then would it ſometimes be ſeen to flow out with the Blood upon opening a Vein; which was never yet ſeen by any Perſon. And in my own Practice, I have order'd innumerable Perſons, both Men and Women, ſome with Child, and others that have given Suck, to be let Blood, but never could obſerve the leaſt drop of *Chylus* in the Blood that has been drawn forth. Neither did any of thoſe eminent Phyſicians, with whom I diſcours'd this Point, ever ſee the ſame. Neither can any man produce an Example of a Man found in Health, out of whoſe Veins, being open'd, Chyle ever flow'd with the Blood, or was ever ſeparated from it. Perhaps it may be objected, That Reaſon ſhews us, and Experience confirms it, That in big-belly'd Women, and ſuch as give Suck, if they are in perfect health, the *Chylus* is ſeparated from the Blood, and pour'd forth into the Breaſts of the one, and into the *Amnion* of the other; which could not flow thither, but out of the Sanguiferous Veſſels carry'd toward thoſe Parts. To which I anſwer, That the *Chylus*, that is carry'd to the Breaſts and *Amnion*, as alſo that which flows through the Womb and Bladder, was never infus'd into Blood-bearing Veſſels, or mix'd with the Blood, and ſo neither can be carry'd through the one, nor ſeparated from the other; but flows to thoſe Parts through other quite different conceal'd Parts; of which Paſſages, we have ſufficiently diſcours'd, *l.* 1. *c.* 18. & 31. & *c.* 2. *of this Book*. Beſides all which, Reaſon is altogether repugnant to this Opinion. For when the Aliments and Alimentary Humors loſe their firſt Forms, by reaſon of the Concoction of the Bowels, and aſſume another Form, the ſame thing cannot but happen to the *Chylus* concocted in the Heart. For Example; An Apple being eaten, and concocted in the Stomach, is altogether depriv'd of its Form, and is made into *Chylus*, which is no more an Apple, and of which no particles can be again reduc'd to the Form of an Apple. So the *Chylus* being dilated in the Heart, cannot but by its ſtrong and ſudden Effervescency, preſently loſe all its Form of Chyle, and receive the Form of Blood; which, though it be rawer at the beginning, than the reſt of the Blood, frequently circulated and dilated in the Heart, yet is it Blood, wherein there is not the leaſt Form of *Chylus* remaining. But ſome will ſay, That Crudity preſuppoſes that ſome particles of that *Chylus* are not altogether chang'd into Blood, but ſtill retain the Form of *Chylus*, and are ſo mix'd with the Blood. I deny it, for that is not call'd crude Blood, wherein all the Particles of the *Chylus* are not ſanguify'd; but that which is not reduc'd to a juſt Spirituoſity and Maturity. And hence the Blood which is made firſt of all

all out of the *Chylus* dilated in the Heart, though it be cruder, yet it is not a *Chylous* and *Flegmy* part of the Blood: wherein there are no Particles of the *Chylus* remaining, only it wants as yet a juſt Spirituoſity in ſome meaſure. In like manner, as the Seed, which is made of the Blood, becomes to be crude and unfruitful in Old Men, not that there are any Particles of Blood in it, that are not as yet chang'd into Seed; but becauſe that Seed, by reaſon of the weakneſs of the Spermatic Parts, is not yet reduc'd to a juſt Spirituoſity and Maturity. For no man, how quick-ſighted ſoever, obſerv'd any Particles of Blood in crude Seed, much leſs ſhall be able to ſeparate any Blood from it. Thus an unripe Apple is call'd crude, not that any Earthy or Arboreous Particles are conſpicuous in it, or any way ſeparable from it; but becauſe the Spirit latent therein, is not yet reduc'd to ſuch a Thinneſs and Maturity, as to put forth it ſelf; which Maturity it afterwards acquires by the Heat of the Sun, and thence a farther Concoction.

However, ſeeing that the *Serum*, *Choler*, and ſometimes other corrupt Humors contain'd in the Veſſels, paſſing through the Heart together with the Blood, frequently retain their own form, and remain what they were before, why may not the ſame thing befal the *Chylus*? Becauſe the *Chylus* is an Alimentary Juice, grateful to Nature, by previous Concoctions, and Mixture with the Lymphatic fermentaceous Juice, in ſuch a manner, and to that end prepar'd and made fit, that it may be preſently dilated in the Heart, and be turn'd into Blood, no way able, being once dilated in the Heart, to retain the form of Blood. As Gunpowder is dilated of a ſudden by the Fire, and loſes its Form. But it is otherwiſe with the *Serum*, Cholet, and other corrupt Humors mix'd with the Blood, which are neither prepar'd after a convenient manner, nor to the ſame end, but unfit to make Blood, though paſſing with the Heart through the Blood; and hence it is, that they remain what they were before. Like a Clod of Earth impregnated with Oil, and ſo thrown into the Fire, retains the Form of Earth; becauſe its Subſtance is not ſo eaſily deptiv'd of its Form by the Fire; though the Oil, with which it is impregnated, being dilated and kindl'd by the Fire, loſes the Form of Oil in ſuch a manner, that not a drop of it remains, nor can it ever be reduc'd to the Form of Oil.

Whether ſome part of the Chylus *may not be mix'd with the Blood.*

XIX. It is therefore another Queſtion, *Whether if not always, and a conſiderable quantity, yet ſometimes, and a ſmall quantity of meer* Chylus *may not be mix'd with the Blood?* This we altogether deny of Arterious Blood, but not always of the Veiny Blood; for that ſometimes there is a Milky and Chylous Juice in the hollow Vein, as well infus'd out of the Milky Pectoral, into the Subclavial Veins, as in Women that give Suck, carry'd through the Mammary Veins, to the Hollow Vein it ſelf. Perhaps it may ſo happen, that by reaſon of ſome Mixture, the Colour of the Blood may be alter'd from Red to White; as Oil of *Vitriol* and *Aqua-Fortis* change the Red Colour of Cloth into White, but then that which appears white in the Blood, is not *Chylus*, but rather ſome Blood which is corrupted: Like that which ſometimes in a certain *Cacochymy* of the Body, and in ſome malignant Diſeaſes, appear'd dy'd of a whitiſh colour. Of which *Bauſchius* gives us an Example of a Prieſt that lay ſick of a Malignant Fever, who, being three times let Blood, every time his Blood appear'd white; having an Ulcery Subſtance, like the White of an Egg. I ſhall add another remarkable Example, ſeen by my ſelf at *Nimmeghen*; where, at that time, the Peſtilential Fevers were very rife. In this Diſtemper, if the Patients were let Blood the two firſt days, they bled very well, and very good Blood; but they that were let Blood after the ſixth or ſeventh day, their Blood came forth generally whitiſh, and yet for want of Appetite, they had hardly eat or drank in all that time; for the Fever perplex'd the Patients more with its Malignity and extraordinary Anxiety, than with its Heat and Drought. Thus, in many ſick People, who, by reaſon of long Faſting, little *Chylus* happens to be in the Stomach; and beſides, what they do take, ſoon corrupts, by reaſon of ſome ill habit of Concoction; and in ſome Crazy People, in whom, by reaſon of vicious Concoctions, ill Humors increaſe in the Body, I have ſeen a whitiſh Film ſwimming upon the Blood, when it has been cold; but quite different from *Chylus*; which doubtleſs deceiv'd *Needham*, and others, maintaining their Opinion. But as to what *Needham* adds in Confirmation of his Error, That the *Chylus* may be ſeparated from the Blood by Art, and that by ſtrewing upon it a certain Powder,

Powder, I very much ſuſpect the Truth of it, eſpecially ſince he produces his Experiment from the far-fetch'd Relation of another Perſon unknown to him; from whom, as he ſays, one *Schneiderus* had it by Report. But I, that am not to be ſeduc'd by theſe little Hiſtories, do ſay this, That I will undertake to change the red Colour of the Blood into white and milky, by Infuſion of a certain Liquor; but thence it does not follow, that I am therefore able to ſeparate by that means the *Chylus* from the Blood; but rather, that I corrupt the good Mixture of the Blood. But omitting theſe Trifles, let us return to the Buſineſs.

Whence the red Colour proceeds.

XX. *From that Concoction and Dilatation, which happens in the Heart, the Blood acquires a Redneſs, to which the Heart is not at all contributary, as many think, becauſe of its Redneſs; but by accident is caus'd by that Concoction which is made in the Heart: By which the Salt and Sub-acid Particles, now more exactly mix'd with the Sulphury, in a ſhort time produce that Colour from themſelves.* For Chymiſtry teaches us, That by the exact Mixture of Salt, and eſpecially of Acid Particles, with Sulphury, a red Colour is produc'd, as appears by the Diſtillation of *Salt-peter*, that contains in it many Sulphury Particles. So never ſo little Oil of *Vitriol*, being mix'd with Liquors or Syrups of a pale Red, become of a deep red colour, if there be any thing of Sulphur in thoſe Liquors. Now theſe Salt and Sulphury Particles are carry'd with the *Chylus* it ſelf, in which nevertheleſs they do not beget a red colour, becauſe the Salt Particles do not as yet ſeem to have attain'd to any degree of Acidity, and hence are not ſufficiently attenuated and mix'd with the Sulphury; but being as yet both crude, and too much incumber'd in the viſcous Particles, lie hid, out of which, they are at length ſet at Liberty, and grow Spirituous, by the ſingular Heat and Fermentation of the Heart: and then being equally mix'd in Spirituoſity, and concurring with equal Vigor and Force, they produce that red colour. And 'tis known in Chymiſtry, that Sulphury Spirits riſe with a ſmaller Heat; Salt, not without a briſker Fire; and ſo it happens in the Concoctions of the Bowels. By the Concoction of the Stomach, and the Fermentation rais'd by the Choleric and Pancreatic Juice, the Sulphury Particles are moderately diſſolv'd and ſeparated from the Aliments, and then enclos'd within the Salt Particles, which cannot be brought to ſuch a perfect Diſſolution by ſo ſoft a Heat, which prevents the Diſſipation of the Sulphury Particles, by reaſon of their extraordinary Volatility. Now the Salt Particles, by their Mixture with the Sulphury, by degrees becoming more diſſolv'd, and turn'd ſub-acid, at length attenuated by the intenſe Fermentaceous Heat of the Heart, burſt forth more Spirituous; and then being exactly mix'd with the Sulphury Particles, with which they are dilated, become exactly red: But if the Heart afflicted with any Malignant Diſtemper, has not a Fermentative Power, ſo vigorous, as ſufficiently to attenuate, dilate and unite the Salt with the Sulphury Particles, then the Blood is not altogether ſo red; but ſeveral pale Humors are found to be mix'd with it, as is ſeen upon Blood-letting in Malignant Fevers; which are no part of the *Chylus*, but only corrupt Humors.

How the Parts are nouriſh'd by the Blood.

XXI. *This is the true manner of making the Blood which ſerves for the nouriſhment of all the Parts; and contains in it ſelf Matter adapted for the nouriſhment of all and ſingular the Parts; out of which that is appropriated to every one, which is moſt convenient for their nouriſhment; to ſome Particles more concocted and ſubtile; to others, leſs concocted and thicker; to others, Particles equally mix'd of Salt and Sulphur, as in fat Bodies; to others, more Salt and Tartarous, as in Sinewey and Boney People; and to others Particles are united and aſſimilated; ſome diſpoſed one way, ſome another.*

The Diverſity of Figures.

XXII. *This Appoſition proceeds chiefly from the Diverſity of Figures, which, as well the particular Particles of the Blood, as the Pores of the ſeveral Parts obtain.* For hence it happens, that the Blood being forc'd into the Parts, ſome Particles more eaſily enter ſome ſort of Pores, and others, another ſort; and are figur'd one among another after various ſhapes and forms; and ſo are immediately united with the Subſtance of the Parts, and are converted into their Nature; and thoſe which are not proper for ſuch a Figure, are

are carry'd to other Parts; till the remaining and improper portion is again tranſmitted back to the Heart, there to be concocted anew, and endu'd with another more proper Aptitude. It is vulgarly ſaid, That the ſeveral Parts attract from the Blood, and unite the Particles moſt ſimilar to themſelves. But there is no ſuch Attraction allow'd in our Bodies; neither are the Parts endu'd with any Knowledge to diſtinguiſh between Particles ſimilar or diſſimilar. But the Blood, ſuch as it is, is equally forc'd to all the Parts, but the Diverſity of Figures, as well in the ſeveral Particles of the Blood, as in the Pores of the Parts, is the Reaſon that ſome Particles ſtick, and are united to theſe, and others to other Parts; to theſe, after one manner; to thoſe, after another. From which Diverſity, the Diverſity of Subſtances ariſes, ſome ſofter, ſome harder, ſome ſtronger, and ſome weaker.

The Nouriſhment from the Blood two-fold.

XXIII. *This Nutrition by the Blood, is caus'd two manner of ways.* 1. Immediately, when the Particles of the Blood are immediately oppos'd, without any other previous or remarkable Alteration; as is to be ſeen in the Fleſhy and Fat Parts.

2. Mediately, when Appoſition happens, after ſome remarkable Concoction or Alteration preceding; as in the Bones, to whoſe Nouriſhment, beſides the Salt Tartareous Particles of the Blood, there concurs the Marrow, made before out of the Blood; as alſo in the Sinews, which are not nouriſhed only by the Blood, communicated to their outward Tunicle, through inviſible little Arteries, from the continuation of thoſe Arteries that paſs through both Membranes of the Brain and Spinal Marrow; but alſo by the Salter Sanguineous Particles, firſt prepar'd by the Concoction of the Brain.

The Degrees of Nutrition.

XXIV. *But in this Nutrition from the Blood, three Degrees are to be obſerv'd.* 1. When the Body is ſo nouriſh'd, as to grow by that Nouriſhment. 2. When it is nouriſh'd, and remains in the ſame Condition. 3. When it is nouriſh'd and decays.

Four Things neceſſary to Nutrition.

XXV. *Now that the Cauſe of this Diverſity may be more plainly known, we are to conſider, That there are Four Things neceſſary to perfect Nutrition.* 1. The Alimentary Juice it ſelf. 2. The Appoſition of this Juice. 3. Then its Agglutination. 4. And laſtly, Its Aſſimilation.

The Alimentary Juice is the Blood, which is forc'd by the Beating of the Heart, through the ſmalleſt Arteries, to the Parts that are to be nouriſh'd, and is thruſt forward into their Pores; by which means the Subſtance of the Parts does as it were, drink it in. And becauſe in theſe Pores, ſomething of Humor, tending toward Aſſimilation, remains over and above, hence it comes to paſs, that the convenient Particles of the new-come Blood, more agreeable to that Humor, are mingl'd with that Humor ſticking there before, and being there concocted by the convenient Heat and proper Temper of the Parts, are by degrees agglutinated, and more & more aſſimilated to the Subſtance of the Parts, and are ſo prepar'd and diſpos'd by the Vital Spirit continually flowing into the Parts, together with the Arterious Blood, that they acquire Vitality, and become true Particles of the Parts, endu'd with Life and Soul, equally to the reſt.

Growth.

XXVI. *If now, while that Nutrition is made, the ſmaller Particles of the Parts, by reaſon of their moiſter Temperament, or cooler Heat ſtick but ſoftly to each other, then upon their firſt Appoſition, by reaſon of the great Plenty of Alimentary Humor flowing in by the impulſe of the Heart, they eaſily ſeparate from each other, and admit more Nutritive Humor than is requiſite to their Nutrition; from the Plenty of which, being agglutinated and aſſimilated, happens the Growth of the Parts by degrees, becauſe more is appos'd and agglutinated than is waſted.* But when by the increaſe of Heat, the ſmaller Particles are dry'd up, and become hard and firm, as in Manhood, then they no longer ſeparate one from another, by reaſon of the Alimentary Juice forc'd in, and the Juice that is pour'd into the Pores in great quantity, is vigorouſly diſcuſs'd by the more violent and ſtronger Heat, that no more can be appos'd and aſſimilated than is diſſipated; whence there follows a ſtay of Growth; wherein the Subſtance of the Parts will admit no Exceſs or Diminution of Quantity.

Stay of Growth.

Decay.

Laſtly, Thoſe ſmaller Particles of the Parts, are not only dry'd up by that ſame ſtronger Heat, and the Pores are ſtreightn'd ſo as to admit leſs Alimentary Juice; but the Alimentary Juice it

ſelf, by reaſon of the Heat dimimiſh'd by Time and Age, and conſequently a worſe Concoction of the Bowels, grows weaker, and leſs agreeable to the Subſtance of the Part it ſelf; and then, as in Old Age, the Parts themſelves decreaſe and diminiſh: For the unaptneſs of the Pores in the Parts, and of the Nutritive Juice it ſelf, as alſo of the concocting Heat, and the ſmall Quantity of the ſaid Juice, are the reaſon that leſs is appos'd than is diſſipated. Now this Decreaſe is chiefly and moſt manifeſtly obſerv'd in the ſofter Parts, whoſe ſmalleſt Particles are moiſter, and more eaſily diſſipated, as the Fleſh, the Fat, *&c.* But it is leſs obſervable in the Bones, and other harder Parts, whoſe ſmalleſt Particles are more fix'd, and not ſo eaſily diſſipated.

Whether Old Men grow ſhorter.

XXVII. Here, by way of *Parentheſis*, a Queſtion may be propos'd; *Whether Old Men grow ſhorter than they were in their Prime?* This many affirm, and confirm by Ocular Teſtimony. *Spigelius* abſolutely denies it: *For*, ſays he, *That they grow ſhorter, I deny; but that they grow leaner, I grant. For the Bones, according to which the Length of the Body is extended, being hard and ſolid Bodies, are neither diminiſh'd by Age, nor the Force of any Diſeaſe: But the Fleſh is waſted and conſumed, as well by Age, as by many other Cauſes: So that if they ſeem to be ſhorter than Young Men, it proceeds from hence, becauſe that all their Joynts are bow'd, as well by Muſcles ſhrunk for want of Heat, as by the Ligaments dry'd up, and cover'd with Brawn.* But though *Spigelius* brings theſe Reaſons for his Negative Opinion, yet the Affirmative ſeems the more plauſible; ſeeing that Decrepit Old Men, not only by reaſon of the bowing of their Joynts and Body, ſeem ſhorter, but becauſe of neceſſity they muſt be ſomewhat, though not much ſhorter, by reaſon of the Griſtles between the *Vertebræ* of the Back-Bone, and the Joynts of the Thighs, and other Parts; which being ſofter and more tumid in Young Men, and conſequently ſeparate the Bones more at a diſtance one from the other, of neceſſity muſt extend the Body ſomewhat more in Length; but in Old Men, waxing drier and thinner by degrees, muſt of neceſſity, for the ſame Reaſon, ſhorten the Body: To which we add, That the Ligaments of the Joynts, being dry'd up, contract the Joynts cloſer one to another. And this is apparent in ſuch Old Men, who being ſtronger, walk ſtill upright; for if they meaſure with the ſame Meaſure wherewith they meaſur'd themſelves in their Youth, you ſhall find 'em to want the breadth, ſome, of a Thumb, ſome, of half a Thumb, others, of two Thumbs of their Height in their youthful days: which we have known true by Experience.

Two doubts

XXVIII. *From what has been already ſaid concerning the making and Principles of the Blood, two obſcure and doubtful Matters are brought to Light. Firſt*, That there are four Humors in the Blood, Flegm, pure Blood, Choler and Melancholy. *Secondly*, Whence proceed the Temperatures of Bodies.

Of the four Humors of the Blood. Flegm.

XXIX. *Flegm is that part of the Blood, which being firſt made out of the Blood, and not much circulated or dilated in the Heart, becomes more crude, and leſs Spirituous.*

Blood.

XXX. *Pure Blood is that part of the Sanguineous Maſs, which being ſeveral times circulated and dilated in the Heart, attains to moderate Spirituoſity.*

Choler.

XXXI. *Choler is that Part of it, which by frequent Circulations and Dilatations is exalted to a more extraordinary Thinneſs, and becomes moſt Spirituous and boyling hot.*

Melancholy.

XXXII. *Melancholy is that Part, out of which, by ſeveral Circulations and Attenuations made in the Heart, the Spirituous Particles are for the moſt part drawn out and waſted, and hence the Blood becomes colder, thicker, and more earthy.*

Here by the way take Notice, That we do not mean by *Flegm*, *Choler* and *Melancholy*, the Fermentaceous Humors which are bred in the Stomach, Liver and Spleen, as if the Maſs of Blood conſiſted of thoſe Humors being mix'd together; only that theſe Names are comparatively apply'd to the Blood, as the Parts of it are more or leſs, or overmuch concocted.

The four Humors are always in the Blood.

XXXIII. *But in regard, That becauſe of the continual Waſte and Conſumption of loſt Spirits, there muſt be a Reparation of new ones, by means of freſh Nouriſhment, hence it follows, that theſe Four Humors are neceſſarily in the Blood, and that the Blood ſhould conſiſt of them.* For out of the Aliments

ments sufficiently prepar'd, and first dilated in the Heart, there comes a Flegmatic Juice, which by degrees, by means of several Circulations and Dilatations in the Heart, turns into pure and excellently well temper'd Blood. But proceeding farther, above its just Temper of Heat, turns into Choleric Blood: And having lost its more subtile Particles, turns into Melancholy. And thus all these four Juices, which consist all of Salt and Sulphury Particles, nor differ one from another, but only in their stronger or weaker Concoction and Spirituosity, are mix'd together, and so by a certain Perpetuation of Qualities, the Excesses infringing one upon another, as long as a man lives, they constitute the whole Mass of his Blood, united and render'd fluid by means of the *Serum*. Which *Serum*, especially its Watery Part, is not assimilated to the Parts that are to be nourish'd; but to them conveys the nourishing Particles of the Blood, and by them, when once apposited and assimilated, is evacuated and discuss'd by means of their Heat. Thus in the Gilding of Metals, the finest Gold is beaten into thin Leaves, and mingl'd with Quick-Silver, to make the Gold stick on, which could not be done without the *Mercury*: afterwards, the Vessel being Gilded, and brought to the Fire, the Heat of the Fire discusses, and sends the *Mercury* packing, while the Gold sticks close to the Vessel on which it was laid; such a sort of *Mercury* is the *Serum* in living Bodies, conveying and apposing the Blood to the several Parts.

Whence the Temperaments of the Body proceed.

XXXIV. *As to the Temperatures of our Bodies, they proceed from the various Mixture and Redundancy of the four forementionʼd Juices.*

Phlegmatic Temperament.

XXXV. *If the* Chylus *be made of cold and moist Juices, wherein there is little subtile Spirit, or else sent out crude from the Stomach, or not sufficiently dissolv'd for want of convenient Ferment, such a* Chylus *produces a Flegmatic Sanguineous Juice, which though frequently circulated and dilated in the Heart, yet cannot be exalted by the Heart to a sufficient Spirituosity; and hence there is a greater Quantity of that, and a lesser Quantity of the rest of the Juices; and because the whole Body then is nourish'd with a Flegmatic sort of Blood, thence the Constitution of the Parts is more moist and cold, and so there is a Flegmatic Temperature of the Body.*

Sanguine.

XXXVI. *If the* Chylus *be well temper'd, well concocted, and made out of well temper'd Nourishment, or so made by a good Concoction of the Bowels, then happens a Redundancy of that Blood, and consequently a Sanguine Complexion, and a good Temper of Body.*

Choleric.

XXXVII. *If the* Chylus *be made of Nourishments hot and sharp, or sharply fermented through the more intense Heat of the Bowels, then after a few Circulations, it turns to a very hot and spirituous Juice; which predominating, begets a Choleric Temper.*

Melancholic.

XXXVIII. *If the* Chylus *be made of thick Earthy Nourishments, abounding with much crude and fix'd Salt, and those not well concocted and dissolv'd; then few Spirits are extracted out of it, by the Circulations and Dilatations made in the Heart, and there remains only a thick Juice, without much Spirit; whence proceeds a Melancholic Temper.*

Now the vast Excesses of these Temperatures, are call'd Distempers, and breed several Diseases, Hot, Cold, *&c.*

Whether the Blood and Spirits live.

XXXIX. After this Description of the Principles, and manner of making the Blood and Vital Spirits, before we come to their Use, let us say something of their Vitality; about which, Philophers so much dispute, and Physicians dissent. While the one in Defence of Vitality, say,

1. That the Blood and Spirits variously move themselves according to the Diversity of the Motions of the Mind and Imagination; in Fear, toward the Heart; in Shame, toward the Cheeks; in Lust, toward the Genitals.

2. The Holy Scripture says, That the Soul of the Flesh remains in the Blood.

3. That the Seed being potentially animated, is made out of Blood and Spirits.

4. Because they are nourish'd, as *Hippocrates* witnesses; which could never be, if they did not live. However, they who deny the Blood and Spirits Life, seem in our Judgment to be most

in the Right. 1. Becauſe the Blood and Spirits have not within themſelves the Principle of their own Motion, as bequeath'd to them from the Soul; but becauſe they have their Motion by force of the ſolid Parts, which are mov'd by the Soul, as the Heart, Brain, *&c.* By the Force of which, and that often according to the diverſity of the Motions of the Mind, the Motion of the *Chylus*, Choler, and ſometimes of the Excrements, and various other Humors, is promoted and excited, which no man however in his Wits, will affirm to be living. 2. That the Soul of the fleſh is ſaid to be in the Blood, ſo far as animated or enliven'd Fleſh wants Blood, nay and Air too, as the next Support, without which his Life cannot ſubſiſt. To the *Third*, That Seed Potentially enliven'd, and living, is not generated out of the Blood and Spirits, becauſe the Spirituous Blood, out of which it is made, is living; but by reaſon that by a new Specific Mixture, and Diſpoſition of the Sanguineous Mixture, brought to Perfection by the Heat and Specific Property of the Seminifying Parts, a new and potentially Vital Form is introduc'd, which was not before in the Matter not Vital: as we ſee dead Bodies, rotten Wood: Cheeſe, Rain-water, and Vinegar long expos'd to the Heat of the Sun, will produce Worms alive, whereas there is no Life in any of theſe things. To the *Fourth*, That *Hippocrates* does not aſcribe Nouriſhment, properly ſo call'd, to the Blood and Spirits, but only their continual Generation and Supply out of the *Chylus*. As we ſay the Flame of a Lamp is nouriſh'd with Oil, becauſe the Oil is the next Matter with which the Flame is nouriſh'd. To theſe I add, That in an Animal, Life cannot be but in the Parts of the Body; out of which number, that the Blood and Spirits are manifeſtly excluded, we have ſufficiently demonſtrated, *l.* 1. *c.* 1.

Here ſome one will urge, That the Seed is no Part of the Body, and yet it lives Potentially, and therefore why not the Blood?

I anſwer, That though the Seed is a Part of the Body, as of *Peter*, being preſent; from whom it was cut off, and ſtill perhaps remains in his Spermatic Veſſels; nevertheleſs it is only Part of the Body of a future Animal which is to live; even ſuch a Matter, as contains in it ſelf the Ideas of all the Parts of the Animal that is to be form'd. But the Blood cannot be ſaid to be a Part of *Peter*, or the Living Creature, but only a Humor or Juice next nouriſhing the Parts, and to be agglutinated and aſſimilated to the Subſtance by new Concoction, and ſo to be enliven'd with it at the ſame time.

XL. *From what has been ſaid, the Uſe of the Blood appears to be for the Nouriſhment of all the Parts; that is, not only to afford Matter to be aſſimilated to every Part; but to convey a hot Vital Spirit, which excites the Actions and Concoctions of all and ſingular the Parts, and to cauſe the fit Matter for Aſſimilation to be aſſimilated, and ſupply'd in the room of that which is waſted and diſſipated by the Heat.* *The Uſe of the Blood.*

XLI. *But ſeeing the Blood is carry'd as well through the Arteries, as Veins, the Queſtion is, Whether the Parts are nouriſh'd by Veiny or Arterious Blood?* Anciently it was believ'd that the Parts were nouriſh'd by the Veiney Blood, becauſe the Blood was thought to be made in the Liver, and thence to be carry'd through the Veins to the Parts. Which Error being diſcover'd by the Circulation of the Blood, ſince which time, it has been obſerv'd, that the Blood is made only in the Heart, and from thence forc'd through the Arteries to the Parts, and only carry'd back from the Parts through the Veins; thence it has been apparently made clear, that the Body of Man is nouriſh'd chiefly by Arterious Blood. I ſay (*chiefly*) becauſe though it cannot be deny'd, while the Blood returns through the Veins to the Heart, but that ſome ſmall part of it ſweating through the Pores of the Veſſels or Tunicles, are fix'd up and down to various Parts, and nouriſh them; and that the Tunicles of the Veins themſelves are nouriſh'd by the Blood which they carry; and that the greateſt part of the Liver receives its Nouriſhment from the Veiny Blood, as is apparent from the vaſt number of Veins, and ſmall quantity of Arteries that creep through it; yet in ſome other places, where the Arteries accompany the Veins, it is manifeſt, that the Parts are chiefly nouriſh'd by Arterious Blood, being more ſpirituous and concocted, and with greater violence forc'd through the Ends of the ſmall Arteries into the Pores of the Parts. *What Blood nouriſhes.*

XLII. *This ancient Opinion, receiv'd by all the Phyſicians in the Schools, about the Nouriſhment of the Parts* Charleton's *contrary Opinion.*

Parts by the Blood, has Gualter Charleton *oppos'd with great Heat, and endeavors to deſtroy it with moſt Strenuous Arguments, as he believes, by ſhewing the unaptneſs of the Blood for Nutrition.*

His Arguments. The Sum of all his Arguments are theſe:

1. The Blood conſiſts of Four Juices; which, by farther Concoction degenerate all into Melancholy; with which impure Juice all the Parts cannot be nouriſh'd; yet all would be nouriſh'd with it, were they nouriſh'd by the Blood.

2. The Blood never comes to many Parts, as the Brain, the Bones, the Sinews, the Ligaments, *&c.*

3. Lean men, who have moſt Blood, eat moſt, and are leſs nouriſh'd than fat People, who have nevertheleſs leſs Blood, whoſe Veins are narrower, and their Diet more ſparing.

4. They that die famiſh'd, or of a Conſumption, have a great quantity of Blood remaining in their Veins after their Deceaſe, which therefore might have ſerv'd for farther Nouriſhment, and have prevented their Death.

5. The Blood in all parts preſerves its Redneſs, neither does it loſe its Colour in thoſe parts that encline to White; therefore it does not nouriſh them.

6. *Hippocrates* cur'd a Conſumptive Perſon (whom Victuals did no good) by frequent Blood-letting.

7. The Blood is carry'd through the Arteries to the Parts, is mix'd therein with a copious *Serum*, and is there much leſs Fat and Oily, than in the Veins, through which it is carry'd back from the Parts.

8. The Blood is of a quite different Nature from many Parts of the Body, as the Brain, Bones, Membranes, *&c.*

9. The manner of Nutrition is the Progreſs of the Nouriſhment from a ſtate of Crudity or Fixation, to a ſtate of Fuſion, by which its Spirits before fix'd, are exalted to a farther degree of Activity; which Spirits adhering to the Blood, and like a Glutton, devouring, diſſolving and diſſipating the Nutritive Subſtance of the Parts, render it unfit for the nouriſhment of the Parts, for the conſolidating of which, a more fix'd nouriſhment is requir'd.

10. The Blood it ſelf is nouriſh'd by the *Chylus*, therefore it cannot nouriſh other Parts; becauſe moreover there is contain'd in it a Heat that preys upon the Subſtance of the Parts.

11. All the ſeveral Parts ought to be nouriſh'd with a certain Juice of the ſame Nature with that out of which they were firſt form'd; but that is not the Blood, but the Colliquation of the Seed; and therefore their Growth and Nouriſhment cannot proceed from the Seed.

All which being thus concluded, *Charleton* at laſt produces a Similitude between the Flame of a Lamp, and that Fermentaceous Flame which is rais'd in the Heart; and thence concludes the Uſe of the Blood to be the Food of the Lamp of the Flame of Life, and the next Matter for the Generation of the Spirits.

The Refutation. To the *Firſt*, *That* Charleton *greatly miſtakes, while he preſuppoſes that all the Parts muſt be nouriſh'd with impure Melancholy, if they were nouriſh'd by the Blood.* For it has been ſhew'd already, that the Nouriſhment muſt be various, according to the various Nature of the Parts, while ſome are nouriſh'd with a cruder, others a more temperate, others with a hotter and thicker part of the Blood, and all thoſe Parts are always in the Blood, and if there be an Exceſs of the one or the other, then there happens either an Atrophy or a Cachexy. Beſides, he does not conſider, That the Melancholic part of the Blood is not call'd an impure Juice, but only a thicker Juice, and which upon the diſſipation of the more Spirituous Part, is not eaſily exalted again to a farther Spirituoſity, by reaſon of the weakneſs of the Bowels that concoct and prepare the Ferments. Which Bowels, if they happen to be reſtor'd to their former Soundneſs by proper Remedies, then the Blood is reduc'd to a juſt Spirituoſity, and in that manner the Hypochondriacal Affection, the Scurvey, and other Melancholic Diſeaſes are cur'd, by Remedies corroborating the Bowels, diſſolving the Fixedneſs of the Humors, and ſubliming them to Spirituoſity. Laſtly, He does not conſider, that there are ſeveral Parts that require this ſame thicker Parts of the Blood for their Nouriſhment.

To the *Second*, I ſay, *That there are no Parts to which the Blood does not come.* In the middle of the Subſtance of the Brain, innumerable bloody Spots are to be ſeen budding forth. The Sinews admit Blood, which flows to them, through the continuation of the Veſſels creeping through the Membranes of the Brain. Through the Bones paſs Arteries and Veins to the innermoſt Spungy Subſtance, and to the Marrow; and

their

their *Perioſtia* are waſh'd on the outſide every way by the Blood.

To the *Third*, I ſay, *That as for lean men, though they abound with Blood, yet the Bulk of their Bodies does not increaſe ſo much by reaſon of the violent and ſharp Heat of the Blood.* For the violent Heat quickly diſſipates whatever is aſſimilated, contrary to what befals fat Men, who have leſs Heat and Acrimony in their Blood, and therefore out of their leſs Quantity there is more appos'd than diſſipated.

To the *Fourth*, I anſwer, *Men may be ſtarv'd two ways to Death. Firſt*, When the Body is full of evil Juice, and a great Quantity of vitiated Blood abounds in the Veſſels. For in ſuch there is a Neceſſity, that the Heart ſhould be frequently ſupply'd with new and good Juices to comfort and cheriſh it; ſo that if Famine be not the occaſion of Death, yet the Blood becoming more hot, more ſharp, or ſome other way more corrupt, the Heart muſt be overwhelm'd with bad Humors, though there be ſtore of Blood remaining in the Veſſels; for it is not Quantity alone, but good Quality that is requir'd for the Support of Life. *Secondly*, Becauſe that, as well in ſound, as deprav'd Conſtitutions of Body, the Blood is waſted by long Famine; for though thoſe that die famiſh'd, have much Blood remaining in their Veſſels, yet it ſeems to be too little to ſuffice for the Nouriſhment of all the Parts, and hence all the Parts and Bowels being weaken'd, Death enſues.

To this purpoſe, in *Novemb.* 1656. upon the diſſection of a Perſon that had ſtarv'd himſelf to Death, I could diſcover in him no Meſaraic, Intercoſtal, or other leſſer Veins, becauſe they were quite empty'd, ſo that there were hardly three Spoonfuls of Blood in the Hollow Vein, and the Great Artery was altogether empty'd.

In *Novemb.* 1660. we diſſected another Perſon, who by reaſon of a long want of Appetite, had waſted himſelf to Death; in whom we found the Veins and Arteries exhauſted after a wonderful manner, ſo that there were hardly two Spoonfuls in the hollow Vein, and nothing at all in the *Aorta*.

To the *Fifth*, I affirm it to be an Untruth, *That the Blood does not loſe its Redneſs in the Nouriſhment of Parts inclining to White:* For the contrary appears in the Brain; which, that it is nouriſh'd by the Blood paſſing through its Pores, the innumerable Bloody Spots, every where conſpicuous in a diſſected Skull, do ſhew; and yet the Brain is white. Moreover, I ſay, That the Red Colour is eaſily perpetuated by the Specific Concoction of the Heart in the Circulating Blood; becauſe the Sulphury Particles readily concur with the Salt, and mixt with Spirituoſity, are as eaſily united: But in the Blood that already ſtops in the Parts for Nutrition, that Colour is eaſily chang'd again by another Specific Concoction of the Parts inclining to white; when the greateſt part of the Sulphury Particles are again ſeparated from the Salt, or mingl'd after another manner. Laſtly, I add, That in the Blood, beſides the Red Particles, there are many white, and other Particles of various Colours, which the intenſe Redneſs does ſo conceal, that they are not to be diſcover'd but in the ſeparation of the Particles of the Blood. In the ſame manner as in Red Wine there lies hid a moſt Limpid Spirit, and a watery pellucid Part, whoſe Lympid Colour, however, is not conſpicuous in the Wine, but preſently appears upon Diſtillation.

To the *Sixth*, I ſay, That the Blood of ſome Men is over-ſalt, ſharp, thick, or corrupted, who therefore are not reliev'd by Med'cines, unleſs Nature be firſt reliev'd by letting out ſome conſiderable Quantity of that Blood, that ſhe may be the better able to digeſt the new Juices of Nouriſhments, and convert 'em into purer Blood, whereby the better to nouriſh the Body in due manner; and ſuch, no queſtion, was that Perſon cur'd by *Hippocrates*, with frequent Blood-letting.

To the *Seventh*, I ſay, That there is not always and neceſſarily requir'd an Unctuoſity of Blood for the Nutrition of all Parts whatever; but ſuch an Aptitude as agrees with all and every the Parts; which Aptitude does not conſiſt in Unctuoſity alone, as is before ſaid.

To the *Eighth*, I anſwer, That the Blood conſider'd in the whole, ſeems indeed diſſimilar from many Parts of the Body; but conſider'd in its Particles, contains in it ſelf what is like to every Part, there being no Parts which are not compos'd of Salt and Sulphur, by the Aſſiſtance of *Mercury*, variouſly mix'd, according to the Nature of the ſeveral Parts; which Salt and Sulphur are likewiſe the Principles of the Blood. Moreover, Similitude does not lie in the Colour, which may be eaſily alter'd by any new Concoction; but in the Particles that conſtitute the Subſtance, as well

well of the Parts, as of the Blood.

To the *Ninth*, I ſay, That *Charleton* confounds *Nutrition with Sanguification, and that what he ſpeaks here of Nutrition, belongs to Sanguification; between which there is a great Difference.* For Aliment is not ſublim'd to a greater Spirituoſity, for the Benefit of Nutrition, but for the making of good Blood; which afterwards undergoes another Change, for the procuring of Nutrition; which Nutrition does not conſiſt in a farther Sublimation of the Spirits, but rather in a certain new Fixation. To which I farther add, That the Vital Spirits do not, like Cormorants, conſume the Subſtance of the Solid Parts, but preſerve it in its Saneneſs, neither do they render the Blood unfit for Nutrition, but fit, and that thoſe Spirits infus'd into the Parts with the Blood, excite them to their Functions, and as it were, force them to an Aſſimilation with the Nouriſhment brought; which Aſſimilation could never be brought to paſs without the Aſſiſtance of theſe Spirits. Now how the Spirituous Nouriſhment is again fix'd, ſee *l.* 3. *c.* 11.

To the *Tenth*, I ſay, It is no fair Conſequence; *The Blood is nouriſh'd by the* Chylus, *therefore it cannot nouriſh other Parts.* For ſo it would follow, *Wheat is nouriſh'd by the Juice of the Earth, therefore being eaten, ot cannot nouriſh the* Chylus. So alſo I ſay of Heat; *Wine, Wheat, and other Nouriſhments contain in themſelves a hot Spirit; therefore they cannot be chang'd into* Chylus *and Blood, Why? Becauſe a hot Spirit uſes to prey upon the fluid Parts.* What vain Concluſions theſe are! By reaſon of the Spirituous Heat of the Blood, without which the Blood is altogether unprofitable for Nutrition, it is ſaid that it cannot nouriſh the Parts; ſhall therefore any cold Body, or Humor void of all Heat, be Nouriſhment, or profitable for Nouriſhment?

To the *Eleventh*, I ſay, That here *Charleton* altogether forgot himſelf: For before, out of *Harvey*, he had aſſerted, That the Blood was allow'd to be, before any other Part of the Body appear'd; and that out of that proceeded the Matter of which the Birth was form'd, and its Nouriſhment. If this Poſition of his were true, where's the Difficulty, but that the Parts which are made out of the Blood, ſhould be nouriſh'd with the Blood? Moreover, if the Colliquation of the Seed, be like the Parts that are to be nouriſh'd, and that again like to the Blood, then ſhall the Blood be like the Parts that are to be nouriſh'd? Nevertheleſs, we that do not believe the Parts to be fram'd out of the Blood, give this Anſwer to his Propoſition, That the Parts are at firſt form'd out of the Spirituous Liquor of the *Bubble*, and nouriſh'd with the Colliquation of the Seed; but that the whole Subſtance of this Seed is taken out of the Arterious Blood, flowing through the Spermatic Arteries to the Stones, to which alſo the Animal Spirits are alſo ſent through ſeveral little Nerves, therefore the whole Matter of the *Seed*, *Bubble* and *Colliquament* is in the Blood, and being concocted ſpecially in the ſeveral Parts, acquires no leſs an Aptiude to nouriſh the ſeveral Parts, than being generally concocted in the Stones, it obtains an Aptneſs generally to form at firſt all thoſe Parts; and ſo we muſt conclude, That all the Parts have their firſt Conformation, and their ſubſequent Growth and Nutrition, from a Juice altogether ſimilar, which is prepar'd before the one in the Stones, before the other, in the ſeveral Parts; and ſo the Ancient Axiom is true; *We are nouriſh'd with the ſame things of which we conſiſt.* And that other Oracle of *Ariſtotle*; *The Matter is the ſame which augments the Growth of a Creature, with that out of which it was firſt form'd.*

Laſtly, I anſwer to the *Concluſion*, That the Compariſon was ill made between the Fermentation in the Heart, and the Flame of a Lamp: Which Compariſon is eaſily endur'd among Poets and Orators, who only mind Ornament and Elegancy of Words; but not among Philoſophers, that are enquiring after the Myſteries of Nature. For Flame does not only diſſipate the Subject to which it adheres, but alſo deſtroys it, and diſſolves the whole Mixture of it, and renders it uſeleſs; but the Fermentation of the Heart does not deſtroy the Blood, nor utterly diſſolve its Mixture, but by means of the dilatation of the whole Maſs, renders it more exact and ſtrong, and ſo brings the Blood to a greater perfection, and generates Spirits therein; which as they are thin, hot and pure, entring the whole Maſs of the Blood, preſerve it in its perfection, and together with the Blood, which is their own Subject, of which they are a part, being infus'd into the Parts of the Body, by their extraordinary Heat, raiſe into Act the drowſie Heat of all the Parts. True it is, that thoſe Spirits, by reaſon of their extraordinary Subtility and Mobility, con-

continually exhale in great Quantity, and by diſſolving them with their Heat, cauſe a Diſſolution of many fluid Particles of the Body; but this is not becauſe of any Deſtruction, but by reaſon of their extraordinary Subtility. I will give you a Similitude. Wine, when it is diſtill'd, the Spirit of Wine ariſing out of it, is not deſtroy'd by the Heat of the Fire that promotes the Diſtillation, but is ſublim'd to a greater Subtility and Perfection, there remaining all the while in it the Sulphury and Salt particles in a ſtrict Union; the moſt part of whoſe Subtility therefore exhales, and is diſſipated in the Air. But the contrary happens in the Oil of a Lamp, which is indeed attenuated, but ſo far from being brought to a greater perfection, that it is totally deſtroy'd: For the Oil is not made the better, or more Spirituous, but the whole Compoſition of it is deſtroy'd; neither does it remain any longer Oil, nor is made Spirit of Oil: Like Wood, when it is burnt, is thereby reduc'd to Smoke and Aſhes. ¶Or if the Spirit of Wine ſhould take Fire, it would not thereby be made more perfect, but wholly deſtroy'd. And thus it is with our Bodies as in Diſtillation, and not as in the Flame: and therefore the Compariſon of Fermentation with Flame, is altogether abſurd. I confeſs, Blood is the Matter and Subject of the Animal Spirits; but thence it does not follow, that it cannot nouriſh all the parts of the Body: Rather we are thence to infer, that it nouriſhes all the parts, ſeeing it contains the Nutritive Matter, and the Vital Spirit that promotes that Nouriſhment.

And thus falls this new Opinion, ſo obſtinately by ſome defended, and by others as unwarily embrac'd.

Whether the Lympha *be nutritive.*

XLIII. N. Zas, *In his* Dutch *Treatiſe*, Of the Dew of Animals, *believes*, That *the Lymphatic Liquor only nouriſhes the Spermatic Parts*; For this is that which he underſtands by his *Dew*: Of which Judgment alſo is *Clemens Niloe*. Which latter likewiſe writes, That the Blood is altogether unfit to nouriſh the Parts.

1. Becauſe it is of an Earthy Subſtance.

2. Becauſe neither the Blood nor the *Chylus* out of which it is generated in Diſtillation, are forc'd upward into the Alembic, into which only a Watery Liquor falls; and therefore the Blood is not ſubtil enough to come to all the parts, and afford 'em Nouriſhment.

3. Becauſe ſuch a Spirit as is extracted out of the Blood by Chymiſtry, is extracted alſo out of the *Lympha*, which is collected out of the Lymphatic Circle, plac'd near the Jugular Veins.

4. Becauſe there are many Parts to which the Arteries and Veins that convey the Blood, cannot reach. This Opinion of *Clemens Niloe*, differs from *Charleton*'s and *Gliſſon*'s in this, becauſe they think Nutrition to be perform'd by a certain Juice flowing out of the Nerves; the other by the Lymphatic Juice. But *Niloe*'s Arguments are of little moment.

Firſt, For that the Blood is compos'd as well of thicker and ſerous, as of ſpirituous particles, which are both requiſite for Nutrition; nor can one ſubſiſt or act without the other.

The Conſequence of the *Second*, is of no force; becauſe the ſpirituous and ſerous parts aſcend through the Alembic, but not the terreſtrial; for then it is apparent, that the Blood nouriſhes the better for that reaſon: For if it were volatile and ſpirituous in all its Particles, it would be too haſtily diſſipated, and could never be appos'd to the Parts for Nutrition.

The *Third* is altogether as invalid; For he ought to have prov'd that Spirit altogether ſimilar, was extracted out of the Blood and *Lympha*, whereas there is a manifeſt difference to be obſerv'd in the Acrimony. Then grant that ſuch a ſimilar Spirit be extracted out of both; yet I affirm, That ten times as much Spirit may be extracted out of one Pint of Blood, as out of two Pints of *Lympha*. Then it is no wonder, that the Spirit of Blood ſhould ſeem to have ſome likeneſs with the Spirit of *Lympha*: ſeeing that the *Lympha* is continually mix'd with the Blood, and becomes a part of it, and is again generated by it, and ſeparated from it in the Liver, Glandules and other parts, therein to acquire a new Fermentaceous Power, and returns with it into the Veins, and ſo prepares the Blood for dilatation and perfection in the Heart, and then again becomes a part of it. Can any man hence conclude, that only the preparing *Lympha*, and not the prepar'd Blood nouriſhes? Moreover, there is a ſubtile and ſharp Humor drawn out of Urine; nay frequently more ſubtile, or at leaſt ſharper than out of the Blood: Shall it thence be concluded, that not the Blood, but the Urine or *Serum* of the Blood nouriſhes the Parts, as that which penetrates with the Blood, no leſs

leſs to all the Parts than the Blood it ſelf.

The *Fourth* is contrary to what we ſee with our Eyes, ſeeing there is no part of the Body, to which the Blood does not come, as we have already demonſtrated.

And thus vaniſhes this new Opinion; and *Ariſtotle*'s Maxim is reſtor'd, *viz. Blood is the laſt Nouriſhment.* To which Opinion, as formerly, ſo now the whole School of Phyſicians deſervedly adheres.

As for what *Charleton*, following *Gliſſon*, endeavors to perſwade the World, That the *Nutritious* Humor is carry'd to the Parts through the Nerves only, that Fiction we ſhall refute, *l.* 8 *c.* 1.

Malpigius *his Obſervations about refrigerated Blood.*

XLIV. From what has been ſaid, are abundantly demonſtrated the Generation, Nature and Uſe of the Blood in Man; now we ſhall add ſome Particulars obſerv'd by the quick-ſighted *Malpigius*, which he has found out in the Blood extracted out of the Body by Blood-letting, and cool'd in the Air; which gives not a little Light to the more inward underſtanding the Conſtitution of the Blood. *If you deſire to ſee*, ſays he, *a remarkable Sight, view this Blood with a Microſcope, and you ſhall behold a Fibrous Contexture, and a Net, compos'd, as it were, of Sinewy Fibres, in whoſe little Spaces, as in little Cells, ſtands a Ruddy Matter, which being waſh'd away, leaves this whitiſh Net-like Folding behind; which to the Eye reſembles a mucous or ſlimy Membrane. Now that this Net-like Portion of the Blood, with the Film ſwimming at the Top, conſiſts of the ſame Matter and Nature, perhaps a diligent exploration of the ſanguineous Film, will make out: For if the clotted Blood, which is cover'd with a white and thick Film, which, though it does not ſwell with a thicken'd* Serum, *yet ſeems to be skinny, ſoft, and eaſily folded, be ſlit along, and ſeveral times waſh'd; you ſhall obſerve in the upper part of it a Film conſiſting of whitiſh little Skins, and hollow'd through with little Paſſages, and diminutive Bladders, which are full of tranſparent and leſs heavy Juice; and proſecuting farther the Production of this Subſtance, by and by where the clotted Bulk of the Blod begins to look red, you ſhall find it, being divided and ſlit downward, prolong'd into little Fibres, and within their elegant Contexture, ſhall obſerve ſeveral little Paſſages and Hollowneſſes, which ſwell and are dy'd with certain little red Atoms knit together, and in ſome larger Spaces, a yellowiſh* Serum *is comprehended or mix'd with the red Matter. Wherefore Senſe ſeems to intimate to us, that this whitiſh and ſanguineous Net-like Fold ſtrengthens the Body of the whole clotted Matter, and endows it with a more able Corporature, and that ſame Diviſion at the bottom, which ſhews us ſo many various Images of things, depends upon the various colouring Matter contain'd in the ſmall Hollowneſſes: for in the upper Superficies, where thoſe bloody whitiſh Threds are united, there ariſes a whitiſh and compacted Tunicle, but where the Pores are loos'd by degrees, it admits a portion of the yellowiſh lighter* Serum, *and follows a Structure ſomewhat looſer, and eaſily diſſolv'd. At length, the Paſſages being more open, while they ſwell with a red Subſtance, preſently that Film vaniſhes, and then comes a Contexture of Fibrous Blood, drawn out in length downward; which becauſe it contains thoſe red Atoms, compreſs'd by the force of the ſuperior weight, it ſhews a new manner and colour of Subſtance; for there follows a Flaccidneſs from the laſt Productions of the Fibres being lanc'd; and a black Colour, the contain'd Particles being thicken'd, which deceives many with a ſhew of Melancholy; whereas upon the changing the ſituation, they become purple. Whence I thought to take notice of one thing by the way, that in the ſpaces of the Film, as alſo in the whole circuit of the Fibrous Blood, ſometimes in ſome Diſeaſes, the* Serum *therein contain'd grows thick; hence a pale Colour, and that Slimyneſs and manner of Subſtance as in the Gelly'd* Serum, *or White of an Egg. Sometimes we have obſerv'd certain Appendixes drawn out in length through the whole Blood, to which are affix'd leſſer Folds, produc'd in the form of a Net, which are ſometimes diſcernable without a Microſcope.* This Blood being frequently waſh'd with Water, and the half congeal'd *Serum* being waſh'd of, which forms that conſpicuous Net, certain Channels hollow'd in the Fibrous and White Portion of the Blood appear, which does not happen in the ſmall Fibrous Folds above-mention'd, though waſh'd a long time, but ſtill new Folds, and a briſker Whiteneſs appears.

From this accurate Obſervation of *Malpigius*, is perfectly diſcover'd what is generated by the various Concoctions of the ſeveral Bowels out of the Salt, Sulphur and *Serum*, concurring to the Generation of the Blood, and what little Bodies are found out of 'em, of which rightly generated, mix'd and united, good Blood is made, or deprav'd by a filthy or vicious Fermentation.

The Differences of the Blood.

XLV. *And thus we have finiſh'd the whole Diſcourſe of the Blood, only that ſome Differences of it, remain to be conſider'd.*

1. *In reſpect of Quantity*; the Blood is either very plentiful or ſcarce. And this Difference is conſider'd not only among divers ſorts of Animals, of which ſome have more, ſome leſs Blood; but alſo among Men themſelves; among whom the Quantity of Blood is different according to the diverſity of Age, Sex, Temperament, Diet, and Seaſon of the Year, *&c.*

2. *In reſpect of Quality*, the Blood is either good or bad, hotter or colder, moiſter or drier; and that difference is conſider'd according to the Varieties aforeſaid,

3. *In reſpect of Conſiſtency*, the Blood is either thick or thin, congeal'd or fluid. *Spigelius* obſerves, That thoſe People who have a hard and thick Skin, breed a thicker ſort of Blood that eaſily congeals; on the other ſide, where People have a ſoft thin Skin, their Blood does not ſo ſoon thicken. But Experience teaches us, that the good or bad, ſwift or ſlow Concretion of the Blood proceeds from the various Quality of the Blood. So that it is moderately thick, and congeals well in ſound People; on the other ſide in Dropſical, Scorbutical, Hypochondriacal, and other People, it is watery, and hard to thicken.

4. *In reſpect of Colour*, the Blood is either red and well colour'd, or pale, yellow, blackiſh, or dy'd of ſome other bad Hue.

5. *In reſpect of the Humors mix'd with it*, the Blood is either full of Choler, Flegm, Melancholy or *Serum*.

6. *In reſpect of the Containing Veſſels*, the Blood is either Arterious or Veiny.

CHAP. XIII.

Of the Lungs and Reſpiration. See Tab. 9, & 10.

The Definition.

I. THE *Lungs* (*in* Greek, πνεύμων, *from* πνέω, to Breath) *is a Bowel in the Middle Belly, ſerving for Reſpiration, for the Refrigeration of the Blood forc'd from the Left Ventricle of the Heart, and the Expulſion of many Vapors.*

Its Bigneſs.

II. *It is of a remarkable Bigneſs; ſo that being diſplay'd and widen'd by the Breathing in of the Air, it fills the greateſt Part of the Cavity of the Breaſt.*

Its Subſtance.

III. Several Anatomiſts formerly aſcrib'd to it, though erroneouſly, *a fleſhy Subſtance, not unlike that of the Heart or Spleen*; but *Malpigius*, an accurate Examiner of the Lungs, finds its Subſtance to be quite different; and by ocular Experience and Reaſons, has clearly demonſtrated, That *the Lungs conſiſt of a ſoft, ſpungy, looſe and bladdery* Parenchyma, *interwoven with ſlight and thin ſmall Membranes, continuous to the inner Tunicle of the rough Artery, which Membranes being extended and arch'd, form an infinite number of ſmall orbicular and hollow Veſicles, conſtituting the whole Subſtance of the* Parenchyma, *ſo plac'd, that there is a Paſſage open from the rough Artery, out of one Part into the other, and at length all terminate in the Cloathing or Containing Membrane.*

These Veſicles in the Lungs of an Ox, Sheep, or other Animal, newly pluck'd out, and either cut or turn'd to the Light, are conſpicuous by the help of Microſcopes, and are obſerv'd to ſwell with Air, eſpecially about the outward *Superficies*, though they are apparent enough in the inner parts upon blowing up of the Lungs, and in every part diſſected, appear form'd out of a ſlight Membrane extended. How theſe Cavities are diſpos'd, *Malpigius* declares in theſe Words: *After the little Lobes, the Spaces are to be obſerv'd; not every way bare Cavities, and empty Spaces; for they have many extended Membranes, ſometimes parallel, ſometimes angular, which are propagated not only from the external Superficies of the Lobes laterally plac'd, but alſo from the internal Subſtance of the Lobes. Between theſe Membranes run forth ſeveral Veſſels iſſuing out of the little Lobes, which enter thoſe that are oppoſite. By theſe Membranes the Air is receiv'd and ejected, as in the more ſpacious Hollowneſſes, which have a mutual Communion together, that the Air may be compreſs'd out of one Part into another; ſo that the Spaces are the ſame Membranous Veſicles of the Lungs, Diaphanous only and very Thin.*

Interwoven Rings in the Lungs.

Therefore

Therefore all the Veſicles are continuous with the inner Tunicle of the *Aſpera Arteria*, and Griſtles of the Wind-pipe; and hence there is an open paſſage out of the *Aſpera Arteria* into the *Bronchia*, or fiſtulous part of the Wind-pipe, tranſmitting the Air, that paſſes to and again. But whether the Veſicles are ſo diſpos'd, that the Air may go in at one ſide, and out at the other; or whether it comes and goes through the ſame paſſages; or whether there be ſome that reſerve the Air for ſome time, as we ſee in Frogs, the Air may be reſerv'd in the Lungs, cannot be fully diſcern'd. However, that all the Air breath'd in, is not preſently breath'd forth again, but remains for the greateſt part in the Veſſels, and Winding-holes, which are never found empty, the Lungs of Dogs being open'd alive teach us; in which, after Expiration, there ſtill remains very much Air. Alſo the *Lungs* of People deceas'd, wherein is contain'd very much Air, which may be ſqueez'd out with the Finger. Hence *Hippocrates* calls the Lungs the Habtation of Air; and *Galen*, the Venitricle wherein the Air inhabits.

This Air retain'd in the Lungs, contributes to them an extraordinary Softneſs and Smoothneſs, which is chiefly neceſſary, leſt the ſmalleſt Blood-bearing Veſſels ſhould be oppreſs'd with weight; but that they may always remain paſſable; and that the Air within the Right Ventricle of the Heart, being attenuated into a ſubtile Vapour, can not ſo deſcend to the Left Ventricle out of the Lungs, paſſing, as it were, through the Middle Region of the Air, may be condens'd, and ſo more quickly paſs through the Pulmonary Vein to the Left Ventricle of the Heart.

Preternatural things in the Lungs.

IV. *Now that the Subſtance of the Lungs is Bladdery, Reaſon, beſides common Sight, inſtructs us; for many times round, thick and ſtinking Spittle, impoſtumous Matter, little Bladders, Worms, little Stones, and other preternatural things are generated in the Lungs:* Of which Accidents *Bauſchius* has collected ſeveral Examples; and we, in our Practice have ſeen many ſtrange Things ſpit out of the Lungs; and found other things as ſtrange in Perſons diſſected, which certainly were not bred in the Blood-bearing Veſſels, nor in the fiſtulous part of the Pipe, which would have caus'd a Suffocation, violent Aſthma; and perpetual Cough, but of neceſſity had been bred in the Veſſels, and might, yea muſt have been contain'd there a long time.

Obſervation.

V. In the Year 1649. I diſſected a Stone-Cutters Boy that dy'd of an *Aſthma*, in whoſe Lungs I found a great Quantity of Stone-duſt ſuck'd in with the Air, and ſtuffing almoſt all the Veſſels, inſomuch that I ſeem'd to cut through a heap of Sand; ſo that the Veſicles being fill'd with Duſt, could not admit the Air, which was the occaſion of the poor Fellow's Death.

The next Year, two like Caſes happen'd of Stone-Cutters that dy'd after the ſame manner, and were by me diſſected in our Hoſpital. At the ſame time, the Maſter Stone Cutter reported to us, that while the Stones are cut, there flies into the Air ſuch a ſubtile Powder from the Stones, as was able to penetrate the Pores of an Oxe's Bladder, that hung up blown and dry'd in his Shop, ſo that about the end of the Year, he found a handful of Duſt at the bottom of the Bladder; which Powder was that which kill'd ſo many Stone-Cutters, that were not very careful how they preſerv'd themſelves from that Duſt. So that if ſuch a Quantity of Duſt penetrates by drawing in the Breath into the Veſicles of the Lungs, there is no queſtion but Air runs through all thoſe Veſicles. We ſaw a Third that dy'd of an *Aſthma*, who was wont to cleanſe Feathers for Beds, whoſe Lungs were ſtuff'd full of the Duſt that uſually gathers among thoſe Feathers.

The Cloathing Membrane

VI. *The ſaid Bladdery Subſtance is cloath'd on the outſide with a thin and porous Membrane, which moſt Phyſicians and Anatomiſts believe to be deriv'd from the* Pleura: *But I am of Opinion, that it is deriv'd from the exterior Tunicle of the Veſſels entring the* Parenchyma, *and hence it is very dull of Senſe.* The Poroſity of it eaſily appears, if the Lungs be ſtrongly blown up with a pair of Bellows; for by that means the Pores are often dilated ſo wide, that they may be manifeſtly diſcern'd by the Eye, though the Air blown through them, does not go out again; as appears from hence, for that the Lungs being diſtended by the blowing in of the Air, if you tie a convenient Knot at the upper part near the *Aſpera Arteria*, it retains the Air till it become quite dry'd up. Hence we eaſily judge the Conſtitution of theſe Pores to be peculiar, that is, ſuch, that they will permit nothing to paſs forth from the inner *Parenchyma*; but ſuch things as lie next the Lungs on the outſide, in the capacity of the Breaſt, ſeem

rather probable to enter the inner parts of it, if they be not over-thick. But if this Distention by Wind, be violent, and such as 'tis probable never happen'd to any living; yet by that is the Porosity of the said Tunicle made manifest, though larger in some, in others lesser, and from that Diversity it comes to pass, that not in all such *Empyics*, or such as are troubl'd with Impostumes in the Lungs, the corrupt Matter enters the Lungs out of the Cavity of the Breast, and is evacuated by Spittle or Urine, without doubt; because in many, by reason of the thickness of the Matter, the Pores are not wide enough. I remember, at *Nimmeghen* I open'd the Breasts of six or seven Empyical Persons between the Ribs, for the evacuation of the filthy Matter, and having evacuated the Matter, to some I us'd bitter absterstive Injections, which I Syring'd in to cleanse the Lungs; the bitter taste of which, they did not only perceive in their Mouths, but also spit out a good part of it; which was a certain Sign that the Pores of the Tunicle of the Lungs were so narrow in those diseased Persons, that they could not admit any thicker Matter, but only thin Liquors.

Riolanus considering these Pores, the better to explain the manner how the thick Matter is evacuated out of the Cavity of the Breast by Spittle, pretends, that the Air freely insinuates it self into the Capacity of the Breast through the Spaces between the Gristles; and that through them the Steams and purulent Matter contain'd, returns, and yet no Air issues forth through the Pores of the enfolding Membrane into the Cavity of the Breast: Which Opinion *Helmont* maintains with many Arguments, and *Bartholine* refutes, *l. De Pulmon. Sect.* 4. For though Experience tells us, that many times Matter and injected Liquors are suck'd up through the Pores by the Lungs; yet the same Experience tells us, that the Air breath'd in, does not issue forth again through those Pores into the Cavity of the Breast: For many times with a pair of Bellows we have blown up the Lungs taken out of a Beast newly kill'd; but we have observ'd, that the Vessels of the whole *Parenchyma* were very much distended by the Wind, but that no Air issu'd forth through the Pores, or would so much as stir the Flame of the Candle; but if the least Incision were made into the Tunicle, presently we found the Wind to operate upon the Flame. Which is a sign that those Pores are so plac'd, and as it were, fortify'd with Valves, as to admit some Liquors from without, but not to send forth any intrinsic Air.

VII. *The Colour of the Lungs in sound People, is like that of Ashes, or Vary-colour'd; but in diseas'd Persons, especially such as took too much foul Tabacco in their Life-time, I have found it of a blackish Colour.* Also in one that was a Slave to Tabacco and Brandy, and afterwards dy'd of a long *Asthma*, I found all the Lungs not only of a blackish Colour, but dry'd up to an indifferent hardness, with some small Ulcers scatter'd here and there, full of Matter, not fluid, but thick and dry. In another great Tabacco-taker, I found the Lungs of the same black Colour, full of Ulcers, but not dry'd up. *The Colour*

VIII. *Most Anatomists write, that the Lungs in the Birth are of a red Colour, and a thicker Substance, so that being cast into the Water, they sink; quite otherwise than in Men of ripe years, in whom they are altogether Spungy, and of an Ash-Colour, or Vary-colour'd, and somewhat enclining to white.* Which seems a thing so constant to *Swammerdam*, that he reports, how that in the opening the Breast of the Birth, he always found the Lungs plainly contracted, and of a red Colour, and without any Air in the inside. The same thing *Harvey* also asserts; but *Charleton* absolutely denies; who writes, that he has many times try'd, but found no difference of Colour between the Lungs of the Birth and a Man born: But there is a Mistake on both sides; which is easily remov'd, if the times of the Birth be rightly distinguish'd; for I have observ'd by Ocular View, that till the Fifth Month and a half, or thereabout, the Lungs are red, and indifferently thick; but afterwards somewhat softer, looser, and of a Colour somewhat palish, and variegated, and that it is to be found such in dissected Births. *The Colour in a Child before it is born.*

In *December* 1665. I dissected a Woman Seven Months gone, and found the Lungs of the Birth inclos'd in the Womb less turgid than in Men born, but different in Softness and Colour.

In *Novemb.* 1666. In a mature Birth dead in the Womb, a little before Delivery, a Colour somewhat redder than in grown People, but somewhat variegated, and of an Ash-Colour, and such a

Softness

Softneſs and Sponginess of the Subſtance, that the Lungs ſwum when they were caſt into the Water: But in regard that Lightneſs and Spunginess of the Lungs, which prevents its Swimming, and ſomewhat changes the Colour, ariſe from the Air contain'd in the Bladdery Subſtance, the Queſtion is, How that Air enters the Lungs, the Birth not yet breathing? That Air is bred in the Lungs themſelves, out of the moſt ſubtile Vapors rais'd by the Heat out of the moiſt Subſtance of the Blood, and ſo acquiring an Airy Tenuity: After which manner likewiſe that ſame Air is generated, which poſſeſſes the Cavity of the *Abdomen*, and that which is found in the Guts of the Birth unborn. But this ſmall Quantity of Air in the Lungs, which is neither ſufficient in Quantity, nor ſufficiently thick and cold, and can never ſuffice to refrigerate and condenſe the Blood which is forc'd from the Right Ventricle of the Heart into the Lungs, can never ſerve for the Uſe of Reſpiration; only by diminiſhing by degrees the thickneſs of the Lungs, it renders them ſo fit for Reſpiration, that the Infant may be able to breath aſſoon as born, which otherwiſe it would not be able to do of a ſudden, unleſs the breathing Organ were firſt prepar'd by degrees for its performance in that manner.

The Diviſion.

IX. *The Lungs are divided into the Right and Left Part, by the means of the intervening* Mediaſtinum, *each of which many have taken and deſcrib'd for different Lungs, which is the reaſon they never uſe the Word* Lung, *but* Lungs *in the Plural Number.* Some rather chuſe to call the two ſeveral Parts the two Lobes of the Lungs; but there is no neceſſity of cavilling about the Plural or Singular Number, ſo we agree about the Thing it ſelf.

Every one of theſe Parts is again divided into the upper Lobe, which is ſhorter, and the lower Lobe, which is larger; rarely into three Lobes: Yet in Dogs, eſpecially Hounds, there are ſeveral Lobes.

The ſeveral Parts reſemble in ſhape the Hoof of an Ox; on the outſide gibbous, where they look toward the Ribs: on the inſide hollow, where they ſo tenderly embrace the Heart.

Their Diviſion into little Lobes

X. Beſide the foreſaid Diviſion of the Lungs, *Malpigius* by accurate Inſpection has found out another, *That the whole Body of the Lungs conſiſts of many little Lobes, mutually joyn'd together. I have obſerv'd*, ſaith he, in his firſt Epiſtle to *Borellus*, *a more wonderful and more remarkable Diviſion: For the whole Bulk of the Lungs conſiſts of infinite little Lobes, enclos'd within a proper Membrane, furniſh'd with common Veſſels growing to the Branches of the Rough Artery. Now theſe little Lobes may be diſcern'd, if the Lungs being half blown up, be held to the Light or Beams of the Sun; for then certain Spaces appear, as it were diaphanous, which if you follow with a ſlight Inciſion, you ſhall ſeparate the little Lobes, adhering on both ſides to the rough Artery and the Veſſels, and ſhall find them involv'd in their proper Membrane, the Air being breathed in through the rough Artery: which may be ſeparated by diligent Inciſion, and ſhines againſt the Light. But theſe little Lobes will more clearly appear by an elaborate Diſſection of the Spaces after a gentle boyling of the Lungs.*

The Connexion.

XI. *The Lungs are faſten'd in a hanging poſture from the Rough Artery, inſinuating it ſelf into the middle of its Subſtance, and by means of that Artery, adheres to the Neck.* *Fallopius* writes, That only in Man they are naturally faſten'd to the Clavicles and uppermoſt Ribs. But *Riolanus* has ſeveral times obſerv'd them altogether ſeparated from the Ribs and Clavicles; which has been alſo more than once obſerv'd by me my ſelf.

But from the *Pleura* they are for the moſt part found to be free. I ſay, *for the moſt part*, becauſe many times they are alſo faſten'd to it, ſometimes in the whole Circumference, ſometimes in ſome particular Parts, with fibrous Knittings; and in Diſſections I find this Connexion in near the third part of Bodies open'd. For we meet with many Bodies, wherein the Lungs are faſten'd to the *Pleura* with innumerable little Fibres. Nay, many Bodies wherein the outward Membrane it ſelf of the Lungs adheres the greateſt part of it immediately to the *Pleura*. In our Hoſpital and Anatomy-Theatre, I have ſhewn many Bodies, Bodies, wherein the Lungs have ſtuck ſo cloſe almoſt in every Part, to the *Pleura*, that they could not be ſeparated without a forcible dilaceration, which Men nevertheleſs in their Life-time never complain'd of any Difficulty or Inconvenience of Breathing. Whence it appears how little Truth there is in what *Maſſa*, *Riolanus*, *Bartholinus*, *Lindan*, and ſome others write, that for that very

Obſervation.

very reason Difficulty of Breathing becomes diuturnal and incurable. In *Novemb.* 1660. I dissected the Body of an arch Thief that was hang'd, who had liv'd in Health without any difficulty of Breathing, whose Lungs on both sides were so closely fasten'd every way not only to the *Pleura*, but to the whole *Diaphragma* and *Mediastinum*, that they could not be separated without much Dilaceration: But though such a Connexion of the Lungs happen to many men after they are born (for I never heard that any man was born with it) and continue without any detriment to Health, yet in Beasts, especially those of the larger sort, as Horses, Cows, Sheep, Goats, *&c.* this Bowel uses to be free from the *Pleura*, and scarcely ever grows to it, unless the Pleurisie, Inflammation of the Lungs, or some other Disease with an Exulceration preceding; so that in whatever Beast that is kill'd, such a Connexion appears, such an Accident is suspected to have been the Effect of some such Disease.

Several Observations.

XII. *In Practice I have observ'd this worthy taking notice of:*

1. That those in whom I judg'd by certain Signs, that their Lungs stuck to the *Pleura*, more easily and frequently fell into the Pleurisie, than others; during which, if a Suppuration happen'd, they more readily and sooner spit up a Bloody Matter from the Side affected. But that in others, whose Lungs were free from the *Pleura*, they were less frequently troubl'd with the Pleurisie; which if it came to Suppuration, was rarely cur'd by spitting up of Matter, but for the most part turn'd into an *Empyema*. The Reason is this; because that in the first case the Matter may immediately flow out of the Apostеme of the *Pleura*, into the Substance it self of the Lungs annex'd to it, and together with the *Pleura*, perhaps by reason of its Vicinity and immediate Connexion, be somewhat also enflam'd, and so be spit forth. In the latter Case, it cannot but flow into the Cavity of the *Thorax* or Breast, out of which there is no easie Entrance into the Pores of the Lungs.

2. Moreover, I have observ'd the Falshood of the Doctrine of *Platerus*, *Zecchius*, and others, stifly maintaining, That in a Pleurisie, which is a common Disease, never, or very rarely the *Pleura* is enflam'd, but always the outermost Membrane of the Lungs; in which, by reason of its exquisite Sense, such cruel Pains are felt; but that in a *Peripneumony*, the inner Substance of the Lungs is enflam'd; which being obtuse of Sense, therefore the Pains therein, are more obtuse and dull. For in the manifold Dissection of Bodies that dy'd of the Pleurisie, we have found it to be otherwise; that is, that in all People troubl'd with the Pleurisie, the *Pleura* was inflam'd, and that only, if the Lungs were free from its Connexion. But if the Lungs stuck close to the *Pleura*, then that also the adhering part of the Lungs was inflam'd as well as the *Pleura*.

3. In *Decemb.* 1656. I dissected in our Hospital a Woman that dy'd of a Pleurisie, with which she was most cruelly tormented for the first fourteen days: afterwards, the Inflammation coming to Suppuration, the Disease grew more gentle for some few days, though at length she dy'd. In her we found the Lungs altogether free from the *Pleura*, and in the Right Side the whole *Pleura* from the Arm-pits to the *Diaphragma* inflam'd; but that the Apostеme was brok'n about the fifth and sixth Rib. Which two Ribs, by reason of the breaking of the Apostеme, were laid bare from the *Pleura* about the breadth of two Fingers; and that the Matter had flow'd to an indifferent quantity into the Cavity of the Breast; but the Lungs were found without any Inflammation, or any other ill Affection.

4. The like Accident I shew'd in a Man that dy'd of a Pleurisie, in the Year 1657. who being over-heated with Hay-making in the midst of Summer, drank a great Draught of cold Beer, by which he contracted a Pleurisie, and dy'd in a few days. In this Body the Lungs were altogether free from the *Pleura*, and never annex'd to it toward the Ribs, and the whole *Pleura* of the Right Side was inflam'd, without any dammage to the Lungs.

5. Hence it is apparent, That what *Regius* asserts, is not true; *viz.* That in all Pleurisies there is an Inflammation of the outer part of the Lungs, as the Dissections of all Bodies deceas'd of the Pleurisie, teach us; in whom the Lungs are found affected, the *Pleura* always remaining untouch'd. But I believe this good Gentleman writes and teaches these things, out of an Opinion pre-conceiv'd or learn'd from others; as being one that assumes to himself the Writings and Sayings of others, and inserts them into his Books for his own; for he himself was never either any Practitioner nor Anatomist, nor ever dissected the Body of any one that dy'd of

of a Pleuriſie. For meer Inſpection it ſelf demonſtrates the contrary, as appears by the manifold Diſſections of Bodies dying of the Pleuriſie: in which we never found the Pleuriſie to have happen'd without detriment to the *Pleura*. But in ſuch Bodies where the Lungs were affix'd to the *Pleura*, in ſuch we found the Lungs to be affected, in that Part where they ſtuck to the *Pleura*: in Bodies where the Lungs were free from the *Pleura*, the Lungs were never endammag'd in the leaſt. In which particular, we rather truſt to our own Eyes, than the Sayings of others, that never ſaw any ſuch thing. If *Platerus*, who is to be credited, writes, That he obſerv'd ſome ſuch thing, I do not wonder; in regard that among the many Bodies by him open'd, he never diſſected any that dy'd of the Pleuriſie; or in thoſe few which he met with, the Lungs were never faſten'd to the *Pleura*; but as for ſuch, whoſe Lungs were free from the *Pleura*, he does not ſeem to have diſſected any: Of which ſort, we have ſhewn many whoſe *Pleura's* have been highly inflam'd, without any detriment at all to the Lungs themſelves.

6. Moreover, there can be no acute Pain in the Membrane encloſing the Lungs, from any Inflammation thereof, ſeeing that Experience teaches us, that it is very dull of feeling. We have met with two or three Bodies that dy'd of an Inflammation of the Lungs, in whom the whole Lobe of the Lungs of one ſide, together with the exterior Membrane, was found inflam'd; and yet the Perſons themſelves, when alive, complain'd of no acute, but only a dull, heavy kind of Pain; which muſt of neceſſity have been acute, were it true what *Regius* write, That a moſt ſharp Pain proceeds from an Inflammation of the Membrane cloathing the Lungs.

7. Laſtly, Wounds paſſing through the Lungs, though the Membrane be penetrated, cauſe no great Pain in the Lungs; and what Pain there is, the Patients only feel it in the *Pleura* and Muſcles. So likewiſe Ulcers caus'd by corroding Humors in the Lungs, are little painful, though the outward Tunicle be alſo eaten away. Which I ſhew'd publickly in our Anatomy-Theater in the Years 1660, 1663. in two Bodies, whoſe Lungs were ſo ulcerated, that hardly half the Bowel remain'd; and yet thoſe Men, while they lay ſick in our Hoſpital, complain'd of little Pain in their Lungs. Which is alſo daily conſpicuous in Phthiſical Perſons, in whom we have found by Sight and Experience, not only the inner Subſtance, but alſo the outer Membrane of the Lungs corroded and ulcerated, without any great Pain.

8. I ſhall add one more notable Example. In the Year 1660. I was ſent for to open the Body of a certain Countrey-man, who about two and twenty Months before he dy'd, was ſtabb'd in the right ſide of the Breaſt, between the fifth and ſixth Rib; which Wound I then ſaid had pierc'd the Lungs; but being believ'd neither by the Patient, nor the Surgeons that had undertaken the Cure, my Advice was neglected: The Patient never complain'd of any inward Pain; the Bloody Purulent Matter, that flow'd in great Quantity out of the Wound, ſtunk very much. Six Months after the Man was wounded, he went about his uſual Occaſions, and for half a Year held on his wonted Rioting and Drinking, the Wound ſtill remaining open, and ſending forth a ſtinking corrupted Matter in great Quantity. Two or three Months before he dy'd, he was taken with a ſlight Fever, and waxing very lean, dy'd of a Conſumption. When his Breaſt was open'd, we found the Lobe of the Lungs of the wounded ſide, ſo conſum'd with Suppuration, that not the leaſt Bit of it remain'd on that ſide; nay, you would have ſworn there never had been any Lungs on that ſide; which made us wonder how the Man could live in Health and Strength ſo long a time. Moreover, during the whole Courſe of the Diſtemper, the Patient complain'd of no Pain in his Lungs, which muſt have been very tedious, as well by reaſon of the Wound, as the Inflammation and Exulceration ſucceeding, had there been any acute Senſe of Feeling in the Membrane encloſing the Lungs.

XIII. *Three large Veſſels are inſerted into the Lungs.* *The Veſſels.*

XIV. *The Firſt, which is the largeſt Veſſel of all, appointed for conveying of Air and thick Vapors, is the* Trachea, *or* Rough Artery, *furniſh'd with many Productions, call'd* Bronchia. *The rough Artery.*

XV. *The Second and Third, are two large Blood-bearing Veſſels,* viz. *the* Pulmonary Artery *and* Vein; *which being divided into ſmall, and almoſt inviſible Branches, hardly diſcernable, but by the help of a Microſcope,* *The Pulmonary Vein and Artery.*

ſcope, and intermix'd one among another, run through the whole Bladder-like Subſtance, like an Artificial Net, opening one into another with innumerable mutual Anaſtomoſes.

Through the little Branches of the Artery, a Spirituous Blood dilated into Vapor, forc'd out of the Right Ventricle of the Heart into the Lungs, and in them ſomewhat condens'd by the cold breath'd-in Air, paſſes into the little Branches of the Vein, and ſo diſtils into the Left Ventricle; neither in a Natural Condition of Health does any thing of Blood ſeem to flow into the *Bronchia* or Veſicles, ſo as to die them of a Bloody Colour. But if by the corroſion of any ſharp Humor, a ſtrong Cough, or any other violent Cauſe, there happen to be an opening of thoſe Veſſels at any time, then the Blood flowing out of them into the Veſicles, out off thoſe into the *Bronchia*, is caſt forth by Spittle, and cauſes a ſpitting of Blood. In the mean time, in that ſame Paſſage of the Blood through theſe Veſſels, the ſerous Vapors, which, together with the Blood in the Right Ventricle of the Heart, are attenuated into a thin Exhalation, tranſpire in great Quantity through the thin Tunicles of the ſmall Veſſels, and mix'd in the ſmall Veſſels with the cold breath'd-in Air, and by that ſomewhat condens'd, are expell'd with the ſame by Expiration into the *Bronchia*, and ſo forth of the Body; by which means, the Blood is freed from a great part of the ſerous Vapors, of which, a remarkable Quantity is chiefly conſpicuous in cold Weather and Winter-time, when the Vaporous Breath, proceeding from the Mouth, being condens'd by the external Cold, occur to the Sight, and moiſten every thing upon which they light.

Whether the Blood paſſes only through the Anaſtomoſes.

XVI. However, here ariſes a Doubt; *Whether all the Blood paſſes through the* Anaſtomoſes *of the ſaid Veſſels?* Alſo, *Whether many Ends of thoſe Sanguiferous ſmall Veſſels end in the Subſtance it ſelf of the Lungs; and whether the Arteries pour their Blood into it, and the Veins convey it out again as we have ſaid that there is a Circulation in moſt other Parts?* Which, that it is ſo, the Reaſons alledged in thoſe Places, ſeem to confirm: but the Eye ſight contradicts it in the Lungs; by which we find the whole *Parenchyma* to be almoſt altogether without any Blood; neither is there any thing of Blood worth ſpeaking of, to be found in its Subſtance (though it tranſmit eight, nine or more Pints of Blood in the ſpace of an hour) otherwiſe than happens in the Liver, Muſcles, or other Parts that tranſmit much Blood; in which there is a great Quantity of Blood found without the Veſſels.

Moreover, ſhould that Blood be poured forth without the Veſſels into the Bladdery ſubſtance of the Blood, it would partly fill the Veſſels appointed to receive the Air, and ſo render them unfit for Reſpiration; partly occaſion frequent Spittings of Blood, which nevertheleſs are very rare, and manifeſtly happen, when the Veſſels being broken or corroded, the Blood burſts forth into the Bladdery Subſtance, or the *Bronchia*, and never but upon the opening of thoſe Veſſels.

Some perhaps may wonder, that I ſhould ſay, that the Subſtance of the *Parenchyma* ſhould be void of Blood, that is, that no remarkable Quantity of Blood ſhould be ſeen therein, when it is nouriſh'd with Blood, like all the reſt of the Parts; and ſeeing that *Hippocrates* writes, *They who ſpit Blood, ſpit it out of the Lungs*; and ſeeing there is alſo much Blood found in the Lungs of thoſe that are hang'd. To the *Firſt*, I anſwer, That the Lungs are nouriſh'd with Blood like the Arteries, Veins and Nerves; which Veſſels take to themſelves out of the Blood and Spirit that paſſes through them, what is convenient for their Nouriſhment, and alſo receive what is neceſſary for them, through inviſible Paſſages, and little Arteries. Moreover, the Lungs, and that chiefly too, are nouriſh'd by that Blood which is convey'd through the *Bronchial Artery*. And then again, We muſt diſtinguiſh between a very little Blood, which ſerves for the Nouriſhment of the Lungs, and a great deal of Blood, requiſite for the Nouriſhment of the whole Body: The one may be infus'd through inviſible Paſſages into the Bladdery Subſtance, and yet be hardly ever ſeen. The other, by reaſon of its extraordinary Quantity, cannot paſs, but through ſome conſpicuous Conveyance; and it is of the former, not of the latter, that Anatomiſts ſpeak, when they talk of the Paſſage of the Blood through the Lungs. To the *Second*, I ſay, That *Hippocrates*, in the fore-cited Aphoriſm, ſpeaks of the whole Lungs in general, as it conſiſts of its own Subſtance, Veſſels, and

and Membranes, and not particularly of the proper Subſtance of the *Parenchyma* only. And ſo when he ſays that the Blood is ſpit from the Lungs, he means that Blood which is ſpit from ſome corroded or broken Blood-bearing Veſſels, running through the Subſtance of the Bowel. To the *Third*, I ſay, That the Blood which is found in the Lungs of ſuch as are hang'd, did not flow out of the proper Subſtance, but into the Veſicles out of the Veſſels, broken by reaſon of the Obſtruction of the Circular Paſſage.

The Bronchial Artery. XVII. Frederic Ruyſh, *deſcribes another peculiar Artery, hitherto overſeen by all the Anatomiſts, found out by his own ſingular Induſtry; which he calls the* Bronchial Artery, *which chiefly ſeems to convey the Blood to the Nouriſhment of the Lungs, or the* Rough Artery, *or the* Bronchia. *This,* ſaith he, *we thought fit to call the* Bronchial Artery; *for that creeping above the* Bronchia, *it accompanies them to the End. It takes its Riſe from the hinder part of the great deſcending Artery, about a Finger's breadth more or leſs above the uppermoſt Intercoſtal little Arteries, ariſing from the deſcending* Aorta; *and ſometimes two Fingers breadth above the aforeſaid Arteries: Sometimes alſo I have found it to have its Original below thoſe Arteries; for Nature delights in Variety: Sometimes it riſes ſingle, ſometimes double; ſo that oft-times the Great Artery being taken out of a Carkaſs, the Intercoſtals and Bronchials being cut away, the remaining little Trunks of the Bronchials ſeem to counterfeit the Riſe of the Intercoſtals. Hence it obliquely runs under the Lungs, and accompanies the* Bronchia *under the Veiny Artery, to the very End, till becoming no bigger than a Hair, it vaniſhes out of Sight. In the Lungs of Men I have frequently obſerv'd that Artery to creep through the fore-part of the* Bronchia, *which I have ſeldom ſeen in the Lungs of Brutes.*

Lymphatic Veſſels. XVIII. *Beſides the forementionꝰd Blood-bearing Veſſels, by the Report of* Bartholine, Olaus Rudbeck *aſſures us, That he has obſerv'd certain diminutive Lymphatic Veſſels, creeping along the Superficies of the Lungs; which alſo* Frederic Ruiſch *affirms he has ſeen; and farther, that they empty their Liquor into the Subclavial, Axillary and Jugular Veins.*

Nerves. XIX. *Little diminutive Nerves proceed from the Sixth Pair; which ſome will have to be diſperſ'd through the external Membrane only;* but *Riolanus* has obſerv'd to tend toward the inner Parts; and *Bartholin* has always obſerv'd them to accompany the *Bronchia* from the hinder Part; beſides a little Branch that creeps through the outward Membrane from the fore-part. *Thomas Willis* aſſerts, That thoſe little Nerves, together with the Blood-bearing Veſſels, are diſtributed through the whole *Lungs*, and reach both the Channels of the *Bronchia*, the Veins and Arteries; ſending their Branches every way. But I cannot perſuade my ſelf, that there ſhould be ſuch a great Quantity of Nerves diſperſ'd through, ſince Reaſon teaches us, they muſt be very few, and very ſmall, by reaſon of the obtuſe Feeling of that Bowel, as has been already ſaid. *Riolanus* and *Regius* indeed allow to its exterior Tunicle, an exquiſite Senſe of Feeling, as deriv'd from the *Pleura*, contrary to Reaſon and Experience, as we have already demonſtrated.

Office. XX. *The Office of the Lungs is to be ſerviceable for Reſpiration.*

Reſpiration what. XXI. *Now Reſpiration is an Alternative Dilatation and Contraction of the Breaſt, by which the cold external Air is now forc'd into the Lungs, and then caſt forth again, together with the Steams and Vapors, that by the Reception of the cold Air, and the Expulſion of it, together with the Serous Vapors exhaling through the thin Tunicles of the Blood-bearing Veſſels, from the Spirituous Blood driven forward into the Lungs, and collected together in the Windings of the Veſicles, that the hot Blood, ſpirituous, and dilated into a thin Breath, proceeding from the Right Ventricle of the Heart, may be refrigerated, and ſomewhat condens'd in the Lungs, and many Serous Vapors ſeparated from it, that ſo it may more readily deſcend into the Left Ventricle of the Heart, and there be dilated and ſpiri-*

tualiz'd anew; and be wrought to a greater Perfection.

Its End. XXII. For because the Blood breaking forth from the Right Ventricle of the Heart into the *Lungs*, is much dilated, very light, and requires twenty times a larger Room than condens'd Blood, which the left Ventricle cannot afford, hence there is a necessity that that same Vapor seal'd up, be again condens'd into the Thickness of Blood, and so become heavier; partly, that by reason of its being more heavy, it may descend to the Left Ventricle; partly, that being by that means more compacted, it may more easily be comprehended by that Ventricle, and so be dilated anew. For, as in Chymical Stills, the Liquor being reduc'd into a thin Vapor, cannot be contain'd in so small a Room or Vessel, as it was contain'd in before Attenuation; nor cannot be gather'd together, and again distill'd to a greater Perfection of Spirit, till that Vapor lighting into a cold Alembic, be again condens'd into Water, and flows through the Neck of the Alembic, to be receiv'd by another Vessel, and after that, to be again distill'd. So the Blood in the Right Ventricle of the Heart being rarifyd, and become Spirituous, of necessity must be somewhat condens'd again by the Refrigeration of the Air suck'd in, to the end that being so made more ponderous, and possessing less Room, it may flow to the left Ventricle, and refresh the fervent Heat of the Heart with a new Refreshment. Moreover, beside the foresaid Refrigeration, the cool suck'd-in Air affords another Benefit; that it presses forth out of the small Pulmonary Arteries, into the smaller little Veins, the Blood which is thrust forward into the *Lungs*, and by the said Refrigeration prepar'd for Defluxion, and now ready to go forth by means of the Distension of the whole Bowel, and consequently, the great Compression of the Vessels; and from these Arteries, drives it forward through the great Pulmonary Vein, into the Left Ventricle of the Heart; which is the Reason that so little Blood stays in the *Lungs*, and so little is found therein when a man is dead.

What kills People that are strangled. XXIII. *Whence it is manifest what it is that kills those that are hang'd or strangl'd.* For besides that the Serous, or, as others say, Fuliginous Vapors, for defect of Respiration, are not dissipated, the Spirituous and Boiling Blood forc'd into the *Lungs*, is not refrigerated nor condens'd; whence the *Lungs* are over-fill'd and distended with an over-abounding vaporous Spirit, so that there can be nothing more supply'd out of the Right Ventricle of the Heart (as no more Air can be forc'd into a Bladder which is full already) and by reason of its extream Lightness, nothing, or very little can descend to the Left Ventricle: so that it wants new Nourishment, and has nothing to pour into the *Aorta*, and so the Circulation of the Blood is stopp'd, and the Heart faints away for a double Reason; and then the Blood not flowing to the Brain, by and by the Brain ceases its Function, and generates no more Animal Spirits, or forces them to the Parts; and so the Sence and Motion of all the Parts fail. And hence it is apparent, why in a Stove that is over-heated, many times we fall into a Swoon; because the Air being suck'd in, cannot sufficiently condense the vaporous Blood, for want of Cold; so that the *Lungs* become fill'd with that Blood, and afford but little or no condens'd Blood to the Left Ventricle, to be dilated anew.

Cause of Swooning in Stoves.

The necessity of Respiration. XXIV. *That this is the true Reason of Respiration, it appears from hence*; That Animals, which have but one Ventricle of the Heart, have no *Lungs*; and the Reason why the Birth does not breathe in the Womb, is, because the Blood is not mov'd by the *Lungs*, from the Right, to the Left Ventricle; so that it wants no Condensation in the middle way, or Compression made by Inspiration; only the *Lungs* grow for future Uses. And then the Reason why we are constrain'd to fetch our Breath quicker, when the Blood is heated by Fevers, or Exercise, or any other Causes; as, when we suck in a hotter Air, is this, to the end, that by frequent Respiration there may be a swifter, and more convenient Refrigeration and Condensation of the Blood.

How the Blood is cool'd. XXV. *But the said Refrigeration does not come to pass in the Lungs, because the Air breath'd in, is mix'd with the hot blood forc'd from the heart into the Lungs,* (as was the Opinion of *Ent* and *Deusingius*, and is still the Judgment of many other Philosophers at this day;) *but because the cool Air entring the* Bronchia *and Bladdery Substance of the Lungs, cools the whole Lungs, as also the Blood contain'd in its Blood-bearing Vessels;*

Veſſels; as Wine contain'd in Glaſs-Bottles, and ſet in cold Water, or Snow, is cool'd without any Mixture either of the Snow or Water.

Some indeed think, that though it be not much, yet there is ſome of the ſuck'd-in Air which is mix'd with the Blood (and among the reſt, *Malachias Truſton* defends this Opinion) and carry'd with it to the Heart; to the end, that by its Mixture, the Blood may be made more Spirituous and thinner; for which they produce theſe Reaſons.

1. Becauſe there is ſome Air to be found in the Ventricles of the Heart, beſides the Blood.

2. Becauſe that in the Plague-time, the contagious Air infects the Heart.

3. Becauſe they who fall into a Swoon, preſently come to themſelves upon the holding of Vinegar, Roſe or Cinamon-Water, or any fragrant Spices to their Noſtrils; becauſe that Fragrancy entring their *Lungs*, together with the Air ſuck'd in, is preſently mixt in the Air with the Blood, and preſently carry'd to the Left Ventricle of the Heart. But this Fiction ſeems to be of no great weight: For, were it true, then ought the Air to be mix'd at all times with the Blood in the *Lungs*, nor could good Blood be generated without its Admixture; but no Air can be mix'd with the Blood in the Birth enclos'd in the Womb; and yet the Blood which is then made, is as good and as perfect without any Mixture of the Air. And therefore I anſwer to the *Firſt*, That the Air which is contain'd in the Ventricles of the Heart, cannot be ſaid to be carry'd thither by any Inſpiration, becauſe it is equally as well in the Right, as in the Left Ventricle; whereas there can no Blood deſcend with Air to the Right, becauſe of the Obſtacles of the Semilunary Valves. Moreover, ſuch a kind of Air is to be found in the Cavity of the *Abdomen*; which cannot be ſaid to be carry'd thither by Inſpiration: beſides, that ſuch a ſort of Air is found in the *Abdomen* and Ventricles of the Heart of Births inclos'd in the Womb.

To the *Second* and *Third*, I ſay, That the inſpir'd malignant Air does not therefore infect the Heart, becauſe it is mix'd with the Blood; but becauſe the Blood paſſing through the *Lungs*, endues them with an evil Quality, which is thence communicated to the Blood contain'd in the Veſſels, and ſo to the Heart: For as the hot Air impreſſes a hot Quality, ſo a cold Air, a cold one; ſo a venomous or putrify'd Air, or a fragrant Air impreſſes a contagious or fragrant Quality to the Blood and *Lungs* therein contain'd. For, that a Quality be communicated to another Body, there is no neceſſity that the Body from which that Quality flows, ſhould be mix'd with the Body to which that Quality is communicated. For, that red-hot Iron ſhould warm, there is no neceſſity that the Iron ſhould enter the Body that is to be heated: 'Tis ſufficient that the ſmall red-hot Particles of the heated Iron, by their vehement Agitation, violently alſo agitate the ſmall Particles of the adjoyning Body to be heated, and ſo by that violent Motion cauſe Heat: As when a piece of Antimonial Glaſs, put into Wine, gives it a vomitive Quality, there is no neceſſity the Antimony ſhould be mix'd with the Wine; and ſo, when the Wine enters the Body of Man, it ſuffices, that by its Quality (for it comes out exactly the ſame weight as it was put in) it has ſo diſpos'd the Subſtance of the Wine, as to make it vomitive. When Corn is grinding, there is no neceſſity that the Wind ſhould enter the Wheels and Mill-ſtones; for by the Motion of the Sails the Wheels and Mill-ſtones will move, though the Wind, that gives the Motive Quality, do not enter the Flowr or Wheat. Laſtly, if the Air inſpir'd ſhould be mix'd with the Blood, then if a man ſhould blow into the *Lungs*, when freſh, with a pair of Bellows through the Rough the Artery, the Breath would break out through the pulmonary Artery toward the Left Ventricle of the Heart, which we could never obſerve in any Experiments that ever we made. Moreover, if the Air ſhould enter the Blood-bearing Veſſels, not only thoſe Veſſels, but the Parts themſelves which are nouriſh'd with the Blood, would be puſt up with the Air, and be continually infeſted with flatulent Tumors.

XXVI. Charleton *utterly rejects this ſame Refrigeration of the Lungs, and the Uſe of Breathing; and oppoſes it with three or four Arguments, but ſo inſipid, that they deſerve no Refutation*; and then he concludes, *That the Air is ſuck'd in for the finer Subtilization of the Blood, and heating of the Vital Spirits.* Which *Willis* alſo affirms in his Book againſt *Highmore*. But becauſe it is an Opinion repugnant to the very Principles of Philoſophy, it needs no great Refutation. For it is a known thing in Philoſophy, Charleton's Error.

That Cold condenſes, but Heat attenuates. The Firſt is ſo true, that in the Inſtrument call'd a *Thermometer*, it is ſo conſpicuous to the Eye, that it is never to be contradicted. So that there cannot be a greater Subtilization of the Blood by the cold Air ſuck'd in by the *Lungs*, but without all queſtion, a Condenſation rather. Now if thoſe Learned Men before-mention'd, would have held, That there is a greater Subtilization of the Blood by ſucking in of the hot Air, we ſhould have readily granted it; but then we muſt ſay too, that that Subtilization will ſoon be too much, unwholeſom, and in a ſhort time will prove deadly: And that it is not the End of Reſpiration, for the Blood to be ſubtiliz'd by it; but that being ſubtiliz'd, and forc'd out of the Right Ventricle of the Heart into the *Lungs*, it ſhould be there condens'd. But if for all this, they will ſtill maintain the contrary, then of neceſſity they will run upon a hard Rock of Neceſſity: For then it will follow, that the hotter the Air is, that is ſuck'd in, ſo much the ſwifter and eaſier will the Blood be, and the Refreſhment of the Heart greater; and Men that live in a hot Air, would have leſs need of Reſpiration. And by Conſequence alſo in a Fit, where there is preſent need of Refreſhment, as in Burning Fevers, where the Spirits are very much waſted, it would be requiſite to lay the Patients (for the quicker reſtoring of their loſt Spirits, and refreſhment of the Heart) in warm Beds, or expos'd to the roaſting Heat of the Sun, leſt the Blood ſhould be too ſlowly ſubtiliz'd in a cold Bed by the cold Air breath'd in, and ſo the Heart and Spirits want their due and ſeaſonable Refreſhment. But how contrary theſe things are to Reaſon, and Experience, is obvious unto them, who have but ſo much as ſaluted Phyſical Practice at a diſtance. Which, when *Gualter Needham* had throughly conſider'd, he will not permit the *Lungs* any Faculty to heat or ſubtilize the Blood, and proves his Opinion by ſtrong Arguments.

The new Opinion of Alexander Maurocordatus.

XXVII. Alexander Maurocordatus *of* Conſtantinople, *oppoſes this Opinion of the Lungs having the Gift of Refrigeration, and brings ſeveral Arguments to uphold his Undertaking*: Of which, the chiefeſt are theſe;

1. Seeing that the cold Air, which is ſuck'd in, does not enter the Blood-bearing Veſſels of the *Lungs*, but is only circumfus'd about 'em in the Bowels, of neceſſity it can never diminiſh, but by *Antiperiſtaſis*, will rather augment the Heat of the Blood in thoſe Veſſels.

2. Becauſe that in the Birth, which is enclos'd in a hot place, there muſt be a greater Heat, and yet no ſuch urgent Neceſſity of Reſpiration, but that the *Lungs* themſelves lie idle.

3. Becauſe thoſe that are expiring, breath forth a colder Breath.

To the *Firſt*, I anſwer, That a moderate Cold does not cauſe that ſame *Antiperiſtaſis*; only that *Antiperiſtaſis* happens in vehement and ſudden Refrigeration. But ſuch a vehement Cold cannot be occaſion'd by Inſpiration in the Breaſt, which is a hot Part.

To the *Second*, I anſwer, That the Heat in the Birth, is not come to ſuch a Perfection as to want the Refrigeration of Breathing.

To the *Third*, That the Air breath'd forth by dying Perſons, does not feel ſo hot as that which is breath'd forth by healthy People, becauſe that through the Weakneſs of the Heart, the Blood which is forc'd into the *Lungs*, is not ſo hot at that time; and for that the Bowel it ſelf does not heat ſo much; for which reaſon alſo, the Air breath'd in, is leſs hot, and ſo the Breath ſeems to be colder to Healthy People that ſtand by, who are ſufficiently warm; whereas that Breath of Dying Men does not come forth without ſome Heat, which it had acquir'd from the *Lungs*, though leſs than the Heat of the Skins of thoſe that feel it.

Whether the Lungs wheel about the Blood.

XXVIII. *The ſame Author, after he has rejected the Refrigeration of the Lungs, concludes, That the Uſe of the Lungs is to carry about the Blood, and is a kind of a Veſſel appropriated to the Circulation of the Blood.* Which, if it were true, then in the Birth inclos'd in the Womb, and not Breathing; as alſo in Fiſh, that are deſtitute of *Lungs*, there would be no Circulation of Blood, becauſe that ſame Veſſel is either wanting, or elſe lies idle. Which Opinion *John Major* refutes, by producing an admirable Experiment, in his Treatiſe of Reſpiration.

Malpigius *his Opinion.*

XXIX. Malpigius *will have the Lungs to be created, not for Refrigeration, but for a Mixture of the Sanguineous Maſs*, that is to ſay, *That all the ſmalleſt Particles of the Blood, the*

the White, the Red, the Fix'd, the Liquid, Chylous, Sanguineous, Lymphatic, &c. *should be mingl'd exactly into one Mass*, which Mixture he supposes to be but rudely order'd in the Right Ventricle of the Heart, but exactly compleated in the Vessels of the Lungs; and for this he brings many Arguments, which, however, are not so strong, as either to prove his own, or destroy the ancient Opinion. For the most exact Mixture of the Blood is occasion'd by Fermentation; by which all the Particles are dilated into a Spirit or thin Vapor; but this Fermentation is perform'd in the Heart, forbid in the Lungs where Fermentation is forbid, and the dilated Mass of the Blood is condens'd. Moreover, if the Blood expell'd out of the Right Ventricle of the Heart, were necessitated to acquire an exact Mixture in the Heart, where must that have its exact Mixture, which is forc'd out of the Left Ventricle into the *Aorta*, or that same Blood, which neither in Fishes, nor in the Birth inclos'd in the Womb, ever enters the Lungs?

Thruston *his Opinion.*

Malachy Thruston, *desirous to bring something of Novelty upon the Stage of this Dispute, excuses the Heart from the Office of Sanguification, and imposes that Office upon the Lungs; because that the Lungs being distempered, as in a Consumption, all the Parts being nourish'd with bad Blood, grow lean and consume.* As if the same thing did not happen, when the Liver, Spleen, Stomach, Kidneys, Mesentery, and the like Bowels, which are known not to make Blood, are affected with any Ulcer or very great Distemper. Afterwards he adds, That the *Chylus* is but rudely mix'd in the Heart with the Blood, but most exactly in the Lungs, and there ferments, boils, is subtiliz'd, and acquires its Fluidness, and is chang'd into true Blood: But these things are repugnant to Reason. For shall cold Air breath'd in, produce Effervescency and Subtility of the Blood in the Lungs, when Cold hinders Effervescency, and thickens the Blood, as daily Experience teaches us in the Cure of hot Distempers? And whence, I would fain know, has the Womb that Effervescency and Subtility of the Blood, where the Lungs lie idle? Then he produces two great Opinions, as he thinks; the one, from *Phlebotomy*, the other, from *Sighs*. By *Phlebotomy*, says he, Apoplectic Persons, and such as are hardly able to fetch their Breath, and are almost choak'd, feel great Ease: Because that by that means, the Blood which was hasting toward the Lungs, or else heap'd up there before, is drawn off another way; and so the Lungs by degrees are freed from that Burthen. But I shall not grant the Learned Man his Argument: True it is, that in such Distempers we let Blood freely, that the Heart may be weaken'd, and that that being weaken'd, less Blood may be forc'd to the other Parts; and so that Blood which sticks next to the Lungs or Brain, and stops up the little Passages, may have the more time to flow out, and empty it self; and so the Cause of Suffocation is remov'd from the Lungs. For Example, If many People are gather'd together in any Room, and would crowd altogether out at the door, they stop one another; but the less they that are behind press forward, the sooner they that are before get forth. Thus it happens in an *Apoplexy*, *Asthma*, or any such like Affection. For in these Distempers, the stronger the Heart is, and the more Blood it sends from it self, the more are the Lungs, Brain, &c. obstructed and stuffed up; but the more the Heart is weaken'd by a moderate Abstraction of the Blood, and the less forcibly, and the less Blood it sends to the Parts obstructed, so much the more easily the Blood, which already stops up the Passages, being dissolv'd and attenuated by the Heat of those Parts, flows farther, and the Obstruction is open'd, to the Ease of the Party griev'd. But this makes nothing for *Thruston*'s Opinion; as neither does his *Argument taken from Sighs*. For *Sighs* do not happen, as he thinks, by reason of the stronger Effervescency of the *Chylus* in the Lungs, but by reason of the weaker and slower Respiration; which they who are thoughtful and sad, forget to exercise so frequently as they ought, and consequently a Refrigeration not sufficient of the Blood forc'd into the Lungs from the Right Ventricle of the Heart; so that the vaporous and dilated Blood, remaining in too great a Quantity, and therefore flowing more slowly into the Left Ventricle, and keeping the Lungs distended, perplexes the Patient, who is therefore constrain'd by deep Sighs, and the introducing a good Quantity of cold Air to condense that vaporous Blood, to the end that it may flow more swiftly out of the Lungs through the Pulmonary Vein to the Left Ventricle of

of the Heart, and may be alſo more ſwiftly expell'd by reaſon of the larger diſtenſion of the whole Lungs, becauſe of the great Quantity of Air ſuck'd in, oppreſſing its Veſſels. To which, in the laſt place, we may add, That the *Chylus* dilated in the Heart, preſently loſes the Form of *Chylus*, and becomes Blood; ſo that nothing of the *Chylus* enters the Lungs to be there fermented, but that the vaporous Blood enters the Lungs, made of the *Chylus* dilated in the Right Ventricle of the Heart, to be therein ſomewhat condens'd by the Cold of the Air ſuck'd in, and to be attenuated out of Vapour into Liquor. By the force of theſe Reaſons, ſeveral other of *Thurſton*'s Arguments may be eaſily confuted, which he deduces from Exerciſes, *Aſthma's* and the *Boylean* Engin, and ſeveral other things, for the Confirmation of his Opinion.

The Concluſion.

XXXI. *Therefore it remains unqueſtionable, That Reſpiration no way conduces toward the making of Blood in the Lungs, nor for the Reſpiration, Mixture or Circumvolution of it; but only for its Refrigeration.* Which is apparent farther from hence; for that if the Refrigeration requir'd in the Lungs, could be effected by any cooling thing, or Cold coming any other way to the Lungs, Reſpiration were in vain, and ought to ceaſe for a time; as is manifeſt by many Examples to be produc'd in the Queſtion, *Whether a man might live without Reſpiration?*

The Secondary Uſe of the Lungs.

XXXII. *The Secondary Uſe of the Lungs, is in Expiration to enable the Spirit to ſend forth Vocal Sounds, and to Cough.*

The Motion is paſſive.

XXXIII. *But the Motion of the Lungs, in reference to Dilatation and Conſtriction, which happens in Reſpiration, is not Active, but Paſſive:* (Hence *Galen* aſſigns no Action at all to it) becauſe this Bowel is not mov'd of it ſelf in its proper Breathing Motion, but follows the Motion of the Breaſt; which is apparent from hence; for that the Lungs on both ſides are firmly knit and faſtn'd to the *Pleura*; for in ſuch Men it would be hinder'd by its Connexion, in that Motion; whereas they feel no hindrance in Reſpiration, becauſe the Lungs are dilated and drawn together according to the Motion of the Breaſt.

Contrary Opinions.

XXXIV. Platerus *is of another Judgment in this Matter; as alſo* Riolanus; *who believe the Lungs in moderate Reſpiration, to be mov'd by their own Motion, proceeding from their innate Force, without any manifeſt Motion of the Breaſt*: Nay, in *Apoplecticks*, where the Motion of all the Muſcles is aboliſh'd, the Lungs are not only mov'd of themſelves, but alſo by their own Motion move the Breaſt; and in Dogs alſo, and in other Living Creatures, if the whole *Thorax* ſhould be open'd of a ſudden, ſo that the Muſcles could conduce nothing to the Motion of the Lungs, yet the Lungs are to be ſeen moving violently upwards and downwards for all that. The ſame thing *Averrhoes* believ'd of old; who produces this Argument for its Confirmation. *If Reſpiration*, ſays he, *which is perpetual, ſhould follow the Motion of the Breaſt, then there would be a perpetual violent Motion in our Breaſts; but the latter is abſurd, and therefore the former.* *Sennertus* alſo is of the ſame Opinion. *The Lungs*, ſays he, *are mov'd by their proper Power, and the Lungs and* Thorax *are mov'd together, becauſe they conſpire to one end.* The *Lungs* are dilated by an innate Force; which that it may be done more conveniently, and find Room wherein to be dilated, when the *Lungs* are mov'd, the Animal Faculty alſo moves the Breaſt.

The Refutation.

XXXV. To theſe Difficulties I anſwer, *That the two firſt Aſſertions are falſe, in regard that no man can breathe when the Motion of the Muſcles of the* Thorax *and* Abdomen *ceaſes altogether; neither could any ſuch Diſpoſition of the Parts of Man be found, wherein the Lungs do move, the* Thorax *remaining unmoveable.* For the Truth of which, I appeal to the Experience of every Man: For though in *Apoplectics*, the Motion of the Muſcles of the *Thorax* is not altogether aboliſh'd, but only impair'd, yet when it ceaſes altogether, Reſpiration ceaſes, and the Party dies; as alway the Breathing Motion of the *Lungs* periſhes, when the Motion of the *Thorax* ceaſes. Neither is that Motion of the *Lungs*, which is ſeen in Live Dogs, upon the ſudden opening of the *Thorax*, a breathing Motion, which happens with the expanſion of the *Lungs*, but an accidental Motion, rais'd by the *Diaphragma*, as drawing with it upward and downward the annex'd *Mediaſtinum* of the *Lungs* adhering to it; but without any Dilatation, without which there can be no Re-

Reſpiration, nor any Air admitted.

To the Argument of *Averrhoes* I anſwer, *That whatever follows the Motion of another Part, does not of neceſſity follow by violence*; for then the natural and perpetual Motions of the Arteries and Brain, were to be ſaid to be perpetual violent Motions, becauſe they perpetually proceed from, and follow the Motion of the Heart. Beſides, that is no violent Motion that proceeds according to the cuſtomary Courſe of Nature; although it follow the Motion of another Part; but that which is preternatural and diſorderly, as happens in a Convulſion. Laſtly, for a Concluſion, I add, That not only the firm Connexion of the *Lungs* with the *Pleura*, but alſo Experience it ſelf teaches us, That the Breathing Motion of the Lungs is not ſpontaneous. For do but open the *Thorax* of a living Animal on each ſide, the Breathing Motion in the Lungs of Dilatation and Contraction ceaſes; there being a free Paſſage for the Air through the wound into the cavity of the *Thorax*; ſo that in the Dilatation of the *Thorax*, the Air does not neceſſarily enter into the Lungs through the Rough Artery, and diſtend it to fill the concavity of the Breaſt: which Ceſſation of Motion would not happen, if the Lungs ſhould move of themſelves; for there is no reaſon to be given, why it ſhould be leſs dilated upon the opening of the Breaſt, than when it is ſhut. Which ſufficiently refutes the Opinion of *Sennertus*, who believes that the Lungs are fill'd like a pair of Bellows, becauſe they are dilated; for by the foreſaid opening of the Breaſt, it is apparent, that the Lungs are not dilated of themſelves; ſeeing that by the Dilatation of the Breaſt, the Air is compell'd for the prevention of a *Vacuum*, to enter the Rough Artery, and ſo to fill and dilate the Lungs.

Whether the Lungs be mov'd by the Head.

XXXVI. From this Opinion of *Averrhois*, and our own, *Ariſtotle* diſſents; who teaches, *That the Lungs are mov'd by the Heart*; in which Particular *Hoffman* alſo agrees with him. This others as ſtifly deny, and others as badly interpret of the Breathing Motion. But the Miſtake of all ſides proceeds from hence, That they do not ſufficiently diſtinguiſh between the Natural Motion which the Heart contributes to the Lungs, and the Breathing Motion, which does not proceed from the Heart. For that the Heart does contribute ſome certain ſmall Motion to the Lungs, is moſt certain; for when the dilated Blood is forc'd through the Pulmonary Artery into the Lungs, out of the Right Ventricle of the Heart, Reaſon it ſelf ſhews us, that the Lungs are mov'd and heave; as for the ſame Reaſon the Arteries are mov'd and ſwell; though this ſmall Motion is ſo obſcur'd by the forcibly Breathing Motion, that in live Lungs it can hardly be perceiv'd by Ocular Inſpection. And *Ariſtotle* is to be underſtood of this Motion. Yet is not that the Breathing Motion, of which the Anatomiſts generally diſcourſe, when they talk of the Motion of the Lungs; which indeed neither proceed from the Heart nor the Lungs, but is accidental, and follows the Motion of the Breaſt. Moreover, If the breathing Motion ſhould proceed from the Heart, the Pulſes of the Heart and Reſpiration would of neceſſity keep exact time together, and the Lungs would equally ſwell upon every Pulſation of the Heart, as in the Arteries; and hence the Breaſt would be dilated, and when the Motion of the Heart ſtood ſtill, the Lungs would alſo ſtand ſtill. Moreover, the Inequality of Reſpiration would be a Sign of an unequal Pulſe; but Experience tells us the contrary: For the Reſpirations are much leſs frequent than the Pulſes of the Heart. Moreover, Reſpiration may be ſlower or quicker, more or leſs, according to the pleaſure of him that breaths; whereas the Pulſe cannot be alter'd at the Will of any Perſon.

What has been ſaid, ſufficiently refutes *Maurocordatus*; who, aſcribing the whole Motion of the Lungs to the Heart, ſays, That when the Heart contracting the Sides, cauſes a *Syſtole*, then the *Diaphragma* is erected, and the Rings of the Rough Artery are contracted, and ſo the Lungs exſpire, or breathe outward: But when the Heart cauſes the *Diaſtole*, then the *Diaphragma* deſcending, draws down the Lungs, and dilates the Rings of it, which cauſes breathing inward. Which Opinion of his, he endeavours to confirm with many Arguments, which are deſtroy'd however by the aforeſaid Reaſons; as is alſo that Argument, That in an intermitting Pulſe, Reſpiration does not ſtop upon the intermitting of the Motion of the Heart; which, if the Mover ſtopp'd, muſt of neceſſity ſtand ſtill it ſelf.

And as for what he from hence concludes, That the Blood is drawn out of the *Vena Cava* by Reſpiration, into the Right Ventricle, to ſupply Reſpiration, and from thence, into the Pulmonary Artery, *&c.* Theſe things need no Refutation,

futation, since there is no such Attraction to be allow'd in their Body, since all the Humors are mov'd by Impulsion.

The manner of Respiration.

XXXVII. *Therefore the Motion of Respiration depends neither upon the Heart, nor the Muscles of the Breast, which when they dilate the Heart, presently the Air enters the Lungs through the* Aspera Arteria, *and dilates them; but when they contract the Breast, they expel it the same way, together with the Serous Vapors.* But whether we say this Entrance of the Air be either to avoid a *Vacuum*, as some believe; or by the pressing forward of the external Air, by the dilated Breast, and by that means the Impulsion of it through the *Aspera Arteria* into the Lungs, as others assert, comes all to one pass; when both may be true, about which some men so idly quarrel.

What sort of Action it is.

XXXVIII. *In reference to this Motion of Respiration, there is a Question debated among the Philosophers, what sort of Action it is? For some say it is Natural, others Animal, others mix'd of both.*

It is an Animal Action.

XXXIX. *But it is apparent by what has been said, That Respiration is an Animal Action, because it is performed by Instruments that all serve to Animal Motion;* that is to say, the Muscles; and may be quicken'd or delay'd, augmented or decreas'd at our own Pleasure, as in those that sing, and sound any sort of Wind-Musick; and there may be some resolute Men that have held their Breath till they have dy'd; as *Galen* tells the Story of a *Barbarian* Slave, that kill'd himself by holding his Breath. And we find two other Examples in *Valerius Maximus*, of the same Nature.

An Objection.

XL. If any one Object, *That a voluntary Act is done with ones Consent, and cannot be perpetual; and that all animal diuturnal Motion causes Lassitude, which Respiration does not; which moves continually Day and Night, even when we are asleep, and know nothing of it:* I answer, That those are truly to be call'd Animal and Voluntary Actions, which may be, or are done according to our own Will and Pleasure; so that although Respiration go forward when we are asleep, and know nothing of it; nevertheless it is an Animal Action, when it may be guided by our own Will so soon as we are awake, and know any thing of it. They that walk and talk in their Sleep, though they know nothing of it, yet are talking and walking no less Animal Actions for all that. For the Animality of Actions does not consist in Acting only, but in being able to Act by the management and directions of the Will. And therefore we are to understand, that what *Galen* teaches us, That the Animal Actions, some are perform'd by Instinct, and are free, and that others serve ro the Affections of the Mind; that the one proceeds perpetually, and without impediment, when we least think of it; yet might be otherwise directed by us, if we were aware; of which number is Respiration. Others are not perpetual; as Fighting, Running, Dancing, Writing, *&c.* In the one, according to Custom, there is a sufficient and continual Influx of Animal Spirits into the Muscles; and for this reason, there is no Lassitude, though the Actions are diuturnal: But in the other, the Spirits, according to the determination made in the Brain, flow sometimes at this, sometimes at that time; sometimes in greater, sometimes in less Quantity; and thence proceeds Weariness.

Whether a man might live without Respiration.

XLI. *There is one Doubt remaining, Whether a Man born, may live for any time without Respiration?* *Galen* says it is impossible, but that a man that breaths, should live, and that a living man should breathe. And again, he says, Take away Respiration, and take away Life. And indeed all the Reasons already brought for the necessity of Respiration, confirm *Galen's* Opinion; and it is no more than what daily Experience confirms. Yet on the other side, it is a thing to be demonstrated by sundry Examples, that some men have liv'd a long while without any Respiration.

Stories of of such as have liv'd long without Breathing.

XLII. Those Divers in *India*, who dive for Pearl and Corals to the Bottom of the deepest Rivers, will stay for the most part half an hour and more under Water, without taking Breath.

2. A very stately Ship, being built at *Amsterdam*, for the King of *France*, by Misfortune was sunk near the *Texel*; into which the *Spanish* Ambassador, having put aboard a Chest full of Gold, he hir'd a Sea-man, that was a Diver, to go into the Ship as it lay under Water, and to endeavour to get out this Chest.

Cheſt. This Diver ſtaid half an hour under Water, and upon his Return, ſaid he had found the Cheſt, but could not draw it out.

3. I ſaw my ſelf two notable Examples at *Nimeghen*. In the Year 1636. a certain Country Fellow, who dy'd of the Plague, as 'twas thought, lay three days for dead, without any ſign of Reſpiration, or any other Symptoms of Life. At length, when he was juſt ready to be carry'd to the Grave, he came to himſelf upon the Bier, and liv'd many years afterward.

4. In the Year 1638. a certain Woman at the upper end of *Nimeghen*-City, fell into the River, where at that time rode the greateſt part of our Navy, and carry'd away by the ſwiftneſs of the Tide, paſſed through the whole Fleet under Water; and within a quarter of an hour after, when no body thought but that ſhe had been dead, roſe again at the lower end of the Fleet, and was taken up alive and ſafe by the Sea-men.

5. In the Year 1642. a Citizen of *Nimeghen's* Wife, ſitting at the Brink of a Well, fell in backward, with her Head downward, and her Feet only above Water; in which condition ſhe was above half an hour for want of due Help; but at length, being drawn out of the Well, and laid in her Bed for dead, after ſhe had lain for two hours without any Signs of Reſpiration, or Symptoms of Life, ſhe came by degrees to her ſelf, and the next day coming to me, committed her ſelf to my Care, and by Adminiſtration of due Remedies, was reſtored to her former Health.

To theſe Teſtimonies of my own, leſt they may not ſeem ſufficient, I will add three more out of other Authors, which are of great moment.

6. The Firſt is a Story out of *Platerus*, of a Woman, who being condemn'd for killing her Child, was thrown into the *Rhine* bound hand and foot; who, after ſhe had continu'd under Water above half an hour, was at length drawn out again with Ropes, and breathing a little at firſt, came to Life again; and being perfectly recover'd, was marry'd, and had ſeveral Children. To which *Platerus* adds two Stories more of the ſame Nature.

7. The Second, is a Story reported by *John Mattheus*, from an Inſcription upon a Stone in the Church of the Holy Apoſtles at *Cologne*; where it is related, how that certain infamous Perſons open'd the Grave at Midnight, of a certain Woman that was buried the Night before, for the lucre of her Rings and Bracelets which ſhe carry'd with her to her Tomb; but when they came to lay hands upon her, ſhe came to her ſelf, and revived; thereupon the Robbers in a Terror fled: Upon which, the Woman making uſe of the Lanthorn which the Thieves had left behind, went home. Now, no queſtion, this Woman was not dead, but lying without Reſpiration, was taken for dead.

8. A Third remarkable and ſad Example of a Woman that was buried for dead, and afterwards reviving again, is related by *Diomed Cornarius* and *Matthew Heſſus*, and by us from them recited, *l.* 1. at the end of the 25th. *Chapter.*

And ſeveral other Stories of this Nature are to be found in *Levinus Lemnius*, *Hildan*, *James Craſtius*, and ſeveral others.

XLIII. Which are ſufficient to convince us, that a man may live ſometimes for ſome time without Reſpiration. *There remains only to give an Account of the Reaſon of it.* *Galen*, by many ſtrong Arguments, drawn from Experience and Sence, tells us, That the Heat of the Heart is the Cauſe of the neceſſity of Reſpiration: For ſo long as the Heart by its Heat attenuates the Blood, and ſends it dilated out of the Right Ventricle of the Heart into the Lungs, there is a neceſſity for that Refrigeration which is occaſion'd by Reſpiration, that the hot attenuated Blood may be again condens'd, and ſo fall into the Left Ventricle. Which Refrigeration being deny'd, the Veſſels of the Lungs are preſently fill'd with vaporous Blood, and the Bladdery Subſtance with a ſerous Vapour; neither can any thing deſcend to the Left Ventricle, ſo that a man is preſently choak'd. Now from this Foundation there follows another; that is to ſay, as often as the Heart is overmuch cool'd, or the Heat and Motion of it is ſo oppreſs'd by Morbific Cauſes, that it begets no Efferveſcency or Dilatation of the Blood flowing in; then alſo there is no need of any Refrigeration (for the cauſe of the Neceſſity being taken away, the Neceſſity it ſelf is taken away) and ſo long a man may live without Reſpiration. Now in all the aforeſaid Stories and Accidents, even by the cold Water alone, the whole Body and the Lungs are ſo refrigerated, that that ſame Refrigeration is ſufficient to condenſe and cool the Blood, which is forc'd out of the Heart

The Reaſon of what has been ſaid.

into the Lungs; or elſe the Heart is ſo refrigerated and contracted by the extraordinary Fear and Cold together, that it ceaſes almoſt to beat, and ſo a Fit comes, as ſeem'd to happen to thoſe Women in the Fourth, Fifth and Sixth Story. Or elſe the Heat of it is ſo oppreſs'd by Malignant Vapors and Humors, that it abſolutely gives over dilating the Blood, and driving it forth by Pulſation. Now the ſending forth of Blood to the Lungs beating, there is no need of Reſpiration, ſo that a man may want it, and yet live, he not continuing long in that Condition, that is, till the innate Heat be quite extinguiſh'd. But then a man lives without Sence or Motion, like Flies, Frogs, Lizards, and other Beaſts in the Winter, which lie for dead without Reſpiration, becauſe the Heat of the Heart is oppreſs'd, and as it were extinguiſh'd, and wants no Refrigeration. Which being ſo, what ſhall we ſay to *Galen*'s Words, cited in the beginning of this Queſtion; who ſays, 'tis impoſſible for a living man to breath? But *Galen* himſelf foreſeeing this Difficulty, flies to Tranſpiration, which is made through the Pores of the whole Body; and ſuppoſes that to be the loweſt and meaneſt ſort of Reſpiration, or rather its Deputy, which in ſuch Accidents he believes to be ſufficient to ſupport Life. But this Subterfuge will not ſerve the Turn: For when the Heart and Humors are not ſtirr'd, then the whole Body is preſently refrigerated, and neither is the hot Vapour expell'd, nor the cold Air admitted to the Heart: And therefore we muſt rather conclude, that the firſt Opinion of *Galen* is true of the common manner of living, but not of ſuch rarely happening Accidents as thoſe before mention'd, where Things fall out quite otherwiſe.

CHAP. XIV.

Of the Trachea *or Rough Artery.* See Table 11.

Its Definition. I. THE TRACHEA, *or* Rough Artery, *by ſome call'd the* PIPE *or* CANE *of the Lungs, is a Channel which deſcends from the Jaws to the Lungs, and enters them with ſeveral Branches, through which the inſpir'd Air is ſuckt in, and the ſame Air expir'd, is breath'd out again with the Serous Vapours and Steams, for the Refrigeration and Ventilation of the Vital Blood, and the Production of the Voice and Sounds.*

Its Situation. II. *It is ſeated in the fore-part of the Neck, reſting upon the* Oeſophagus, *and ſo deſcending from the Mouth to the Lungs.*

Its Diviſion. III. *About the Fourth* Vertebra *of the Breaſt, it is divided into Two Branches, each of which enter the Lobe of the Lungs of their own ſide.* Theſe are again ſubdivided into two Branches, and thoſe alſo into others, till at length they end in ſmall Branches diſpers'd among the Roots of the Pulmonary Artery and Vein, and continuous with the Veſicles of the Lungs, and opening into the ſame. Which Branches, ſo long as they continue pretty big, are call'd *Bronchia.* *Bronchia.*

Bigneſs. IV. *The Bulk of the Artery differs according to the Variety of Sex, Age and Temperament.*

Subſtance. V. *The Fore-part of it is of a Cartilaginous Subſtance, that it ſhould not cloſe, but remain open always for the free paſſage to and again of the Air and Spirits. The Hinder-part is Membranous, leſt the Dilatation of the* Oeſophagus *ſhould be hindred by the leaning of a harder Body upon it.*

The Rings. VI. *The Griſtly part is not continuous, but compacted as it were of ſeveral Rings, of which the uppermoſt are the biggeſt.* Theſe Rings are equidiſtant one from another, and behind, where they reſt upon the Gullet, are depriv'd of the lower part of their Circumference, while a Membranous Subſtance ſupplies the Defect. The reſt entring the *Parenchyma* of the Lungs, remain whole, and ceaſe to be ſemilunary, as in the upper part, but variouſly form'd, ſome round, ſome ſquare, ſome triangular; and the deeper they enter the *Parenchyma*, the more Membranous, and leſs hard like Arteries, and continuous they are to the Veſſels of the Lungs. But all the aforeſaid greater Rings are exactly joyn'd one to another by Fleſhy Ligaments, the leſſer are joyn'd

joyn'd together only with Membranes.

7. *This Rough Artery is cover'd with a double Membrane; one external, which is very thin, proceeding from the* Pleura, *and firmly fast'nd with Ligaments of Muscles. The other internal, more contracted and thicker, and continuous to the Palate, exquisitely feeling, for the distinguishing of all Annoyances.* This is belmear'd with a fat slimy Humor, to prevent drying, and to sweeten the Voyce; which Humor being wasted by sharp Catarrhs, the Voyce grows hoarse, but being dry'd up by extraordinary Heat, as in Fevers, becomes shrill and acute.

It has double Arteries, some from the *Carotides*, others from the Bronchial Artery, which accompany all its Ramifications. It sends forth Veins to the External Jugularies. It borrows Nerves from the Turning-back Nerves of the Sixth Pair, chiefly dispersed through the inner Membrane, to which they contribute a most exact Sense of Feeling. Which *Lindan* not considering, will not allow it any Nerves at all.

Division. The Rough Artery is again divided into the *Bronchus* and *Larynx*.

The *Bronchus* is the lower and longer Part, display'd with several Branches into both parts of the Lungs.

The *Larynx* is the upper Part, of which we are to treat in the next Chapter.

CHAP. XV.

Of the Larynx *and Voyce.*

THE *Head of the Rough Artery, or the Beginning, continuous to the Mouth, is call'd the* Larynx, *from* λαρυγγίζω, *to call with a wide Throat, and is the Organ of Speech, and fram'd of several Gristles and Muscles, for the forming and expressing of Words.*

Figure. I. *The Figure of it is Circular, extuberant before, and somewhat depress'd behind, to give way to the Gullet in swallowing.*

Vessels. II. *It receives Arteries from the* Carotides, *which convey the Blood, and send that which remains after Nourishment, through the little Veins to the external Jugulars. And the animal Spirits are brought by the Turn-again Nerves of the sixt Pair.*

Its Bulk. III. *The Bulk of it varies according to the Age, Sex or Temper of the Person*; and hence also the Variety of Sounds in Voyces, which in young People, and those that are of a dry Temper, is shrill; by reason of the narrowness of the *Larynx*; in those of riper years, by reason of its wideness, is deeper: Which Variety may also happen from the length or shortness of the *Larynx*; also a strong or weak expulsion of the Air, or plenty or want of it, in respect of which, the Voyce is sometimes shriller or deeper.

Substance. IV. *Besides the Membranes mention'd in the former Chapter, the* Larynx *is compounded of five Gristles, and thirteen Muscles.*

Gristles. V. Columbus *chuses rather to place the Gristles among the Bones, as approaching nearer to a Boney than Gristly Substance; and which sometimes in Old Men turn'd to absolute Bone, and more he affirms, that they contain a Marrowy Substance, like Bones.* But he would have much ado to make out that Marrowy Substance. Moreover, although it turn to Bone in Old Men; yet they are not therefore to be numbred among Bones; for they may be at first for a long time Gristles, and yet afterwards turn to be Bones; as we have sometimes observ'd the Gristles between the Vertebers of the Ribs, and the Spine, have turn'd Boney; which, before that Alteration, no man could have said were Bones.

The Scutiformis. VI. *The first of these Gristles is call'd* Scutiformis, *because of its Resemblance to a Buckler, being almost foursquare like the Bucklers of the Ancients, or rather like an Iron-Breastplate, Gibbous without*; which Gibbosity, because it is more conspicuous in men than in Women; therefore in Men it is call'd *Adam's Apple*, because it is vulgarly believ'd, that part of that Fatal Apple stuck in *Adam's* Throat, for a punishment of his Transgression; and that for that Reason this Gristle grew Bunching out, and the Protuberation became hereditary to his Posterity. But because it is distinguish'd in the Middle by a certain Line, therefore some

have deſcrib'd it as double; whereas it was never found to be double in this World; or if ever any Body did live to ſee it ſo, it was a Wonder, and no common Accident.

In its Angles it has *Proceſſes*; above, two longer, by which it is joyn'd to the lower Sides of the Bone *Hyoides*, by the help of a Ligament; and two ſhorter below, by which it adheres to the lower Muſcle.

Falloſius writes, that he has met with the *Thyroides*-Griſtle Boney, not only in decrepit People, but in ſuch as have been but newly entring into Old Age. Moreover, he adds, That when the *Thyroides* began to grow long, it hardned firſt in the Sides.

The Annular. VI. *The Second is call'd* Anuulary, *becauſe it is round in form of a Ring, and encompaſſes the whole* Larynx.

The Guttal. VII. *The Third and Fourth is call'd the* Guttal, *becauſe the Proceſſes being joyn'd together, reſemble that part of an Earthen Pitcher, out of which the Water flows when we poure it forth.*

Falloſius writes, that he never found the *Guttal Griſtle* Boney, which *Riolanus* affirms he has ſeen.

The Epiglottis. VIII. *The Fifth*, Epiglottis, *ſeated at the Root of the Tongue, and is the Covering of the little Chink or* Glottis, *leſt the Meat and Drink ſhould ſlip into the* Aſpera Arteria *in ſwallowing*; though it be not ſo exactly joyn'd, but that ſome Moiſture may ſlide in between the Junctures into the *Trachea*.

This is ſofter than the reſt of the Muſcles; reſembling an Ivy-Leaf, or the Tongue it ſelf, and therefore is call'd *Lingula*.

Nicolaus Stenonis obſerves a certain piece of Fleſh, compos'd of Glandulous Berries, in the upper part of a Calves *Epiglottis*, from which, he ſays, there are conſpicuous Paſſages to be ſeen through the Griſtle it ſelf to the lower part.

Muſcles. IX. *Theſe Griſtles of the* Larynx, *are furniſh'd with thirteen Muſcles, for the Motion and Modulation of the Voyce; by which the Chink is either dilated or contracted.*

Of theſe, there are Four which are Common, and Nine Peculiar; which are call'd the *Vocal Nerves*, proceeding from the Turn-again Branches of the *Sixth Pair*.

The Common Nerves are they which are implanted into the *Larynx*; yet have not their Original from it. The Peculiar are they which riſe and end in the *Larynx*. Of which firſt, there are four; of the latter, eleven.

Common ones. X. *The firſt Pair of Common ones, which is the lowermoſt, call'd* Sterno Thyroides, *ariſing from the uppermoſt and internal part of the* Sternum, *is inſerted below into the ſides of the Scuti-form'd Griſtle, and while it draws down the Scutiform, it contracts the Chink.*

Hypothyroides. XI. *The other Pair, which is the uppermoſt, call'd the* Hypothyroides, *ariſing from the lower Seat of the* Hyoides-Bone, *is inſerted into the bottom of the Target-faſhion'd, and by raiſing it up, dilates the Fiſſure.* *Riolanus* believes that this Pair is particularly related to no Griſtle; but that it raiſes up the whole *Larynx*.

The Proper Muſcles. XII. *The firſt Pair of Proper Muſcles, which is very ſmall, according to the Opinion of* Veſlingius, *and moſt Anatomiſts, derives its Original from the Annular Griſtle, and ends in the ſides of the Scutiform, or Target-faſhion'd Griſtle; and hence is call'd* Cricothyroides Anticum, *and is thought to move the Griſtle ſomewhat obliquely downward.* On the other ſide, *Bartholinus*, from the Inſertion of the Nerves, judges, that the foremoſt Pair ariſes from the loweſt part of the *Scutiform*, and ends in the Annular Griſtle, and draws it gently to the *Scutiform*, and is almoſt immoveable, that ſo they may be joyn'd, and ſo kept joyn'd; and therefore that this Part ought more properly to be call'd *Thyrocricoides*.

But this Opinion of *Bartholine*, *Riolanus*, according to his Cuſtom, ſharply derides, as one that will not eaſily ſuffer any man to diſſent from himſelf, or to invent, or know any thing in Anatomy, which he either ſaw not, or knew not before.

The binder Cricoartænoides. XIII. *The Second Pair proceeds with a Fleſhy Beginning behind, from the Annular, and ends with a Nervous Subſtance in the lower part of the* Guttal, *or* Artænoides, *and by the ſeparation of the two* Artænoides-*Griſtles*, *opens the* Larynx. It is commonly call'd by Anatomiſts, the

the hinder *Cricoartænoides*, and by *Casserius*, the *Cucular Pair*.

The Lateral Crico-artænoides.

XIV. *The Third Pair, call'd the* Crico-Artænoides, *arising above from the Sides of the Annular, is inserted into the Sides of the Guttal, at the Joynt, opening the* Larynx, *by an oblique Separation of the Gristles.*

Thyro-Artænoides.

XV. *The Fourth Intrinsecal and Broad Pair, call'd* Thyro-artænoides, *both foremost and hindermost, arises from the* Scutiform: Or as *Riolanus* suspects, from the *Cricoides*, and ends in the sides of the *Guttal* or *Arsenoides*, by closing which, it shuts up the *Larynx* in a right Channel.

The Ninth Muscle.

XVI. *The Ninth Muscle* (by others, the *Fifth Pair*, and call'd *Arytænoides*) *arises from the hinder Line of the* Guttal, *and carry'd on with Transverse Fibres, is inserted into the Sides of the same, and binding the* Artænoides-*Cartilage, closes up the* Larynx.

The Muscle of the Epiglottis.

XVII. *The* Epiglottis *in Men is furnish'd with no conspicuous Muscles,* (though *John Van Horn* writes, *that by the Industry of the Anatomists, he found two small suspensory Muscles*) *neither is it mov'd by any Arbitrary Motion, but by the weight of swallow'd Victuals, and drawing the Tongue backward, seems only to be depress'd.* In larger Animals that chew the Cud, and continually gape, through their perpetual devouring of Meat, and have a large *Epiglottis*, it is furnish'd with apparent Muscles; of which some rise from the *Hyoides*, and being inserted into the bottom of the *Epiglottis*, raise it up; others, being seated between the Tunicle, and the Cartilage of the *Epiglottis*, draw it down, and so close the *Larynx*.

The Kernels.

XVIII. *The* Larynx *being form'd of the foresaid Parts, to the end that in the Modulation of the Voyce, it may conveniently perform its Office, wants continual moisture and smoothing; to which purpose, there are fix'd to it several little Kernels.* The most conspicuous of these are two greater, at the upper Seat of the *Larynx*, or the Root of the Tongue; seated at the Sides of the *Uvula* or Cover of the *Larynx*, upon each side one, call'd by the *Latins*, *Tonsillæ*, and vulgarly, the *Almonds*, though they nothing resemble the Form of Almonds, cover'd with the common Tunicle of the Mouth, and furnish'd with small Veins and Arteries, arising from the *Carotides* and Jugulars. These are loose and spungy, and full of little Hollownesses; one large and oval, opens into the Mouth, which in Cows and Oxen, easily admits the Top of the Little Finger; and several small ones, which receive the Spittle, and Moisture of the Brain, and with that continually moisten and make slippery the *Larynx*, the Jaws, the Tongue, and the Gullet; and some think, that the Spittle is there made out of the Humors that fall from the Brain.

The Tonsillæ.

Fallopius well observes, that sometimes the opening of the large Hollowness, or Concavity, resembles a little Ulcer; and sometimes is handled for such a thing by unskilful Surgeons, especially when it gapes overmuch, by reason of the copious falling of the Humors into the Kernel. Now how far it gapes sometimes, I saw in a certain Country-woman, who, in the Year 1652. being hungry, had eaten boyl'd Prunes, and by reason of her hasty swallowing, I know not by what Accident, one of the Stones enter'd into the Opening of the large Concavity. Presently the Kernel swell'd, and by its Compressure, shut up the Passage of Meat and Drink, in such a manner, that she could swallow neither Meat nor Drink, so that she was forc'd to seek my Advice. Upon my keeping down her Tongue, I saw the Kernel very much swell'd in the Right Side, but not inflam'd, and the Opening of it gaping at a more than usual rate; but I could not see the Stone. Presently I gave the Woman to sup a little Decoction of Barly mix'd with Syrup of *Dialthea*, and put my Hand without-side upon the Region of the swell'd Kernel, and squeez'd it very hard, bidding the Woman at the same time to endeavour with all her force to swallow the Liquor in her Mouth. The first time the Liquor burst forth at her Nostrils; but the second time, by reason of my hard squeezing with my Thumb, and by drawing back the Tongue toward the hinder parts, it came to pass that the Stone leapt out of the Kernel, into her Mouth, and then the Woman could presently swallow both Meat and Drink.

In *May* 1664. another Prune-stone slipt into the same Kernel, and I cur'd

again

again the same way. In *December* 1661. I saw an Accident of the same nature, that happen'd to a Citizen of *Utrecht*, into whose Opening of the said Concavity, there fell a piece of hard Cheese, and immediately stopp'd his swallowing of any Victuals. But his Cure was not so sudden as the former, but gave us the Trouble of some Days; so that we were forc'd to draw out the piece of Cheese with a crooked pair of Tongues, made for that purpose.

Wharton *his Error.* *Wharton*, contrary to all Reason, believes these Kernels, which are hardly endu'd with any remarkable Sense of Feeling, to be the true and primary Organs of Taste. Moreover, he believes, that the Spittle-Matter flows from the Brain to those Kernels through the Nerves; as if such a copious Quantity of thick and viscous matter could flow through the narrow, and almost invisible Pores of the Nerves. The Refutation of which, see, *l.* 1. *c.* 16. and, *lib* 8. *c.* 1.

Below the said *Tonsils*, are two other little Kernels, adjoyning to the lower Region of the *Larynx*, of each side one, near the sides of some of the first Rings of the Rough Artery. These, because they are furnish'd with several little Arteries and Veins, have a more Blood-like and solid Substance, than the other Kernels; and are not so easily cut with the Pen-knife. What their Use is, is much question'd: Some believe 'em to be fram'd on purpose to moisten the *Larynx* on the outside with a slimy and fat Moisture, and to render the Gristles more fit for Motion. But in regard there is little need of this Use, for that the *Larynx* does not require this Humectation on the outside, I rather think it fit to be enquir'd, Whether some Spittle-Vessels do not proceed from them?

Parotides. XX. *Next to these, stand the* Parotides, *the* Jugular *and* Maxillar *Kernels, seated under the Tongue*: Of all which, see *l.* 3. *c.* 24.

And thus we have describ'd the Organs that form the Voice.

The Voice. XXI. *Now the Voice is the articulate Sound of a Man, produc'd by the Tongue, through the Repercussion of the Air breath'd in, to express the Conceptions of the Mind.*

A Digression. XXII. *Scaliger*, having a regard to this End, not impertinently alledges out of *Aristotle*, That *Reason is the Hand of the Intellect, as the Speech of Reason, and the Hand of Speech. For the Hand executes Commands, Commands obey Reason, and Reason is the Power of the Intellect.* Also out of *Cicero*, That *Nature hath arm'd Man with three Assistances; Wit for the Invention of Necessaries; Speech, for Succour; and Hands, to bring those things to perfection which the Wit has found out; or we have learn'd by Speech from others.* For by the means of the Voice and Speech, we beg of others what we want, and learn what we know not. Moreover, by the same means, we command what we would have done, and declare what we desire to communicate.

Therefore not every Sound, as, Coughing, or Hauking, *&c.* is a Voice; but only that which is made in the Tongue, and directed by the Mind, by the means of the Muscles of the Tongue. Hence most Brutes, though they have the Organs of Speech, as a *Larynx* with Muscles, Lungs, *&c.* yet they do not send forth an Articulate Sound; because the Air breathing outward, is not artificially directed, or articulated through the said Organs, by the Rational Soul, which they want; so that they either Low, or Neigh, or bark, or send forth some other inarticulate Sound, by the Instinct of Nature only. Nevertheless by Art, Sparrows, Mag-pies, Ravens, and some other Birds, are taught to speak and Sing articulately.

CHAP. XVI.

Of the Oesophagus, *or* Gullet. See Table 11.

THE Oesophagus or Gullet, by the Greeks, οἰσοφάγος & στόμαχος, *by the* Latins, *Gula; by the* Arabians *called Meri; is a round Channel, or Pipe, through which the Nourishment descends from the Mouth to the Stomach.*

Its Situation. I. *Taking its Beginning from the Jaws, under the Rough Artery, it first descends downright; thence turning a little to the Right, to the Fifth* Verteber *of the* Thorax, *then winds again to the Left, toward the Ninth* Verteber, *and at length passing the* Diaphragma *at the Eleventh, it grows*

grows continuous to the upper Orifice of the Stomach, and holds it, as it were, in a hanging poſture.

Its Connexion. II. *It is annex'd to the Jaws and the* Larynx *by the Tunicle of the Mouth, continuous to it ſelf and the Stomach, but to the Rough Artery, the* Vertebræ's, *and other adjoyning Parts, it is joyn'd by Membranes ariſing from the Ligaments of the Back.*

Its Veſſels. III. *It receives Arteries from the* Carotides, *and the deſcending Trunk of the* Aorta; *many times alſo from the* Intercoſtals *and the* Bronchial Artery, *found out by* Frederic Ruyſch. Sometimes alſo it ſends forth ſome few Veins to the Vein that has no Pair, and ſometimes to the Jugulars. And it has ſome little ſmall Nerves from the Branches of the Sixth Pair.

Its Subſtance. VII. *It conſiſts of a Fleſhy and Membranous Subſtance, that it may be commodiouſly extended, and full again, and it is form'd of five Tunicles.* The firſt of theſe is outermoſt; 'tis ſaid to be alſo common to the Stomach: But there is a manifeſt Difference, when the Membrane of the Gullet riſes from the *Pleura*, but that of the Stomach from the *Peritonæum*. The ſecond, which is the middlemoſt, and proper to it, is very thick, ſoft, and fleſhy, like a Muſcle boar'd through, interwoven with round and tranſverſe Fibres, obliquely meeting one another, as Oppoſites, and cutting each other like a St. *Andrew*'s Croſs. The Third, which is the innermoſt, and proper to it alſo, is continuous to the Membrane ſurrounding the Mouth and Jaws, thin, hard and nervous. Which ſome affirm to be ſprinkl'd with ſtreight and long, others with tranſverſe and circular Fibres; but indeed they are ſo ſmall and tender, that it is not an eaſie thing to make any Judgment concerning them.

Kernels. V. *For the moiſtning of the Gullet, ſeveral Kernels are annex'd to it.* That is to ſay above, next the ſides of the Tongue and *Larynx*, two *Tonſils*, affording Moiſture to ſmooth the inward Concavity; of which, in the foregoing Chapter.

On the outſide, the two inferior Glandules are ſaid to moiſten it, ſeated in the hinder part of the Gullet, near the firſt *Vertebra* of the *Thorax* (in the ſame place where the Gullet, giving way to the Trunk of the *Aorta*, turns a little to the Right;) and many times lie ſo conceal'd between the Gullet and the *Oeſophagus*, that they are not to be found, but by diligent Search; and yet about the bigneſs of a *French* Bean, and reſembling the ſhape of a Kidney; and adhering with the convex part to the *Oeſophagus*, ſo that in their place, they ſeem like a Kidney divided in the middle. However, they happen ſometimes to be leſs, and to exceed the number of Two; and then they vary alſo in their Shapes, being in number ſometimes 3, 4, and 5. and they have alſo their Veſſels, diminutive Arteries from the Neighbouring Arteries, and Diminutive Veins, which they ſend forth to the next Veins and Lymphatic Veſſels, conveying *Lympha* to the Lymphatic and Pectoral Channel.

Wharton alſo aſſerts, that they receive remarkable Nerves from the ſixth Conjugation, as alſo from the twelfth Pair of the *Vertebræ*. But in regard they are neither ſenſible of feeling, nor are mov'd, I think it may be queſtion'd, whether they have any remarkable and conſpicuous Nerves or no? Or whether they receive any at all, or at leaſt only ſuch as are hardly viſible? Perhaps the Lymphatic Veſſels, which proceed from 'em, deceiv'd *Wharton*, who took thoſe for Nerves.

Some there are who believe, that theſe Kernels not only moiſten the Gullet without, but alſo withinſide, to facilitate the ſwallowing of Nouriſhment. But in regard that outward Irrigation is no way neceſſary, and for that there is no Paſſage extended from the Kernels toward the outward Concavity of the Gullet, it is apparent, that that can be none of their Uſe; but that they rather collect the Lymphatic Liquor, or ſuck it from the neighbouring Parts, and mix it with the *Chylus*, through the Lymphatic Channels.

Theſe Kernels ſometimes ſwell to that degree, by reaſon of the Afflux of Humors, that they compreſs and ſtreighten the Gullet overmuch, and ſo obſtruct the Paſſage of the Nouriſhment, and ſtarve the Patient to Death; of which we have met with three or four Examples in our Practice.

VI. *The Gullet is mov'd with three Pair of Muſcles, and a peculiar* Sphincter.

The firſt Pair, which is call'd *Cephalopharingæum*, diſmiſs'd from the Con-

fines

fines of the Head and Neck, is expanded with a large Fold of Fibres into the Tunicle of the Gullet, & by raising it upward, streightens the Jaws in swallowing.

The second Pair, call'd *Sphænopharingæum*, arising from the Cavity of the Inner Wing of the Wedge-like Bone, and being obliquely extended into the Sides of the Palat and Gullet, dilates the Gullet. To this, there are some who add another Pair, inserted into the Lateral and Hinder Part of the Jaws and Gullet; by drawing which Part downward, they dilate the Cavity of the Jaws and Gullet.

The third Pair, call'd *Stylopharingæum*, arising from an Appendix of the Pencil-fashion'd Bone, and reaching the Sides of the Gullet, dilates it with the first Pair.

The *Sphincter* of the Gullet, call'd also the *Oesophagæan-Muscle*, springing from both Gristles of the Wedge-like Bone, encompasses the Gullet like a *Sphincter*, and by streightning it, thrusts the Meat downward.

Its Use. VII. *The Use of the Gullet, is to swallow the Meat taken in at the Mouth, which is perform'd by the Fibres of the Gullet, and chiefly by the* Oesophagus. *Galen* numbers this among the Natural Actions; but in regard that Swallowing is an Arbitrary Action, and perform'd by the Instruments serving to voluntary Motion, that is to say, the Muscles, it seems rather to be reckon'd among the Animal Motions. And tho' it serve to a Natural Use or Action, which is Nourishment; however, it is no less an Animal Action than Respiration; which is assistant to Nourishment, yet is an Animal Action.

CHAP. XVII.

Of the Neck.

THE Uppermost Appendix of the Middle Venter is the Neck, call'd Collum, *à* Colendo, *to be worshipped; because it usually is most adorn'd.* Which Etymology no way pleases Us, in regard the Neck was long before the Use of Jewels, and other Ornaments; and therefore we rather derive it from *Collis*, as rising like a Hill above the Shoulders.

This Neck, do we, as most Anatomists do, reckon among the Parts of the Breast; as well by reason of the *Vertebræ's* with the rest of the *Vertebræ's* of the Back, as by reason of their common Use, in regard they afford a common Passage with the rest to the Marrow of the Brain: Though *Spigelius* thinks that Office rather ought to be attributed to the Head.

Upon this Part the Head is set, as upon a more eminent Hill, that from thence, as from a Watch-Tower, it may take a Prospect every way of what is to be desir'd, what avoyded, and be mov'd about with an easie Motion.

Cervix. I. *The hinder Part of it, though it be generally comprehended under the Name of* Collum, *yet is more particularly call'd* Cervix.

The Neck consists of the common Coverings of the whole Body; as also of Arteries, Veins, Nerves, seven *Vertebræ's*, and eight Muscles; of which more hereafter.

Epomis. II. *The hinder Part of the Neck descending, is properly call'd* αὐχὴν, by *Aristotle*, ἐπωμὶς, as being seated above the Shoulders.

Shoulders. III. *Underneath this, stand the Shoulders; by the* Greeks *call'd* ὦμος; being those Parts which are seated at the Sides of the Neck, which give a beginning to the whole Arm, and are constituted by that Eminency which the Head of the Arm makes, when it is joyn'd to the broad Bone of the *Scapula*.

Axilla or Arm-pits. IV. *The contrary Part to this is hollow, seated under the Joynt of the Arm, by the* Greeks *call'd* μασχάλη, or μασχαλὶς; *by the* Latins, *Axilla; and for shortness-sake,* Ala.

Judgment of the Strength of a man's Body. V. *Hippocrates* makes a Judgment of the strength of a Man, by the Thickness or Slenderness of his Neck; and says, that a slender Neck betokens Imbecillity, and a thick Neck, Strength: Not without Reason, in regard that such as are the *Vertebræ's* of the Neck, such are generally the *Vertebræ's* of the Breast, the Loyns, and the *Os Sacrum*; nay, such indeed are all the rest of the Bones, and other Parts answering the Bigness of the Bones, as the Arteries, Nerves, Veins, Ligaments, *&c.* If therefore the Neck be slender and weak, all the other Parts of the whole Body answerable to it, of necessity must be proportionably such; but if thick and strong, the rest of the corresponding Parts of the Body must be proportionably large and strong, unless some Monstrosity of the Neck occasion an Exception to the General Rule.

The End of the Second Book.

THE THIRD BOOK OF ANATOMY.

TREATING *Of the* UPPER BELLY, *or* HEAD.

CHAP. I.

Of the Head in General.

ORder and Method now requires that we should survey the Upper Region of the Body, and enter the Royal Palace of *Minerva*, and that Superior Mansion of Hers, garrison'd with all her Lifeguard, where is the Seat of that most Noble Bowel, to which the Supream Architect subjected the Government of the whole Body.

This uppermost Region, or uppermost Venter, *is the Head, wherein is contain'd the Chief Organ of the most Noble Functions of the Soul.*

Its denomination. I. *It is call'd* Caput, *à* capiendo, *from containing; either because it contains the Brain, which is the most Noble Bowel; or else because the* Sences *and Animal Actions derive their Beginning from it. By the* Greeks *it is call'd* Κεφαλὴ, *as much as to say,* Κέρυλος, or Κέλυφος, *a Shell; because perhaps the Skull encloses the Noble Bowel like a Shell; whence it is call'd by the* French, La Teste.

Its Situation. II. *It is seated in the uppermost and most eminent Part of the Body;* which the *Platonics* think was therefore done, because there was a necessity; and no more than what was just, that the Understanding, which is the Queen of all the Faculties, should be uppermost exalted. But the *Galenics* think it therefore done, that from thence, as from a Watch-Tower, all things to be desir'd or avoided, might be discover'd by the Sight, Smell and Hearing.

Its Shape and Bigness. III. *The Figure of it is Sphærical, somewhat flat on both sides; and in Man above all other Creatures remarkable for its Bigness, to the end, the Brain, which is the most Noble Bowel of all, may the more safely abide in it, being incompass'd, besides other Coverings, with a Boney Scalp, on every side, which sustains and preserves the Shape and Figure of the whole Head.* Concerning which, see more, *L. 9. c. 3.*

Spigelius finds out the convenient Proportion of the Shape and Bigness by the means of four Lines. *To the end the Parts of the Head,* says he, *may be proportionable one to the other, it requires four equal Lines. The* First *is, that which we shall call the Equal Line of the Head, and reaches from the lower part of the Chin to the upper part of the Forehead. The next is that which we call the Line of the hinder part of the Head, and*

reaches from the top of the Head to the first Vertebra *of the Neck. The* Fourth *reaches from one Ear (in which place are the Mamillary Processes) extending to the highermost Part of the Fore-part of the Head. Now if these four Lines are equal one to another, it may be call'd a Proportionable Head; but if they decline to a certain Inequality, they may be said to want so much of a certain, just and natural Constitution, as they approach or recede from the foremention'd Proportion: For if the Face-Line prove the longest, it may be call'd a Long-Head; if shorter, a Short-Head. If the Forehead-Line be longer than the rest, it shall be call'd a Broad-Head; if the Line of the hinder Part of the Head be longer than the rest, then it shall be call'd a Coppid-Head: If all the Lines are equal, then Round and Natural; if all unequal, or some or most, then will the Head be of that Form which* Galen *and* Hippocrates *call* φοξὸν, *or like a Town-Top.*

The Division. IV. *The Head is divided into the Hairy Part, and the Smooth Part. The one is call'd the* Hairy Scalp, *the other, the* Face.

The *Hairy Scalp* is divided into the Fore-part, the Hinder-part, and the Temples: The Face, into the Forehead, and the Parts beneath it; as, the Nose, the Cheeks, *&c.* which are usually comprehended under the Name of the *Face.*

The Region of the Forehead extends it self from the Top of the Nose to the Hair. Hence the Fore-part of the Head proceeds to the Coronal Suture: Between which and the *Lambdoidal* Suture, is comprehended the *Bregma*, or Top of the Head; to which adjoyn the Lateral Parts, or *Temples*, circumscrib'd by the Bones of the *Temples* between the Ears and the Eyes. The Hinder-part, from the beginning of the *Lambdoidal* Suture to the first *Vertebra* of the Neck, is call'd the *Hinder-Part of the Head.*

CHAP. II.

Of the Hair and its Generation.

According to the common Order, we shall first enquire into the Hairy Part of the Head, and discover many things concerning it, which have hitherto been conceal'd.

In this Part, some are the Extream Parts, wrapt about the most Noble Bowel, both for Ornament and Safety: others internal.

I. Among the External Parts, in the first place, we meet with the *Hair*; which are small, long, cold, dry and flexible Bodies, growing out of the Skin; I say, out of the Skin, because they are rarely seen to break out from any other Part; though they have been observ'd sometimes to grow in the Heart, as we have already related, *l.* 2. *c.* 6. And not many Years since, we saw in a Woman such a hideous Quantity of Hair grow from a stinking nasty Ulcer in her Thigh, that it was a great hinderance to us in the Cure, and forc'd us to eat away the spungy, putrid, proud Flesh of the Inside of the Wound, that so fertilly produc'd those Hairs. *The Definition.*

II. *They are call'd* Pili, *from the* Greek *Word* πίλον, *which signifies any thing that is round and oblong.* *The Denomination.*

But *Pili* is the general Name for Hair, and signifies any sort of Hair in whatever Part of the Body it breaks forth. But besides the general Name, there is also a particular Name for the Hair of the Head, by the *Latins* call'd *Capilli*; by the *Greeks*, Κόμη; from κείρω, to shave; which the Ancients call'd Τείχας ἐν τῇ κεφαλῇ, or *Hairs in the Head.* Also in both Sexes they are call'd *Crines*; and more especially in Men, Θρίξι, or *Cæsaries*, from frequent cutting; in Women, κόμη, from κομέω, to adorn; by the *Latines*, *Coma*, from the extraordinary Care that is taken of it.

Nature has produc'd a fruitful Crop of this Hair, not only in the upper part of the Head, but more especially in Men, about the Mouth and the adjoyning Parts, to preserve the more Noble Bowel from the Vehemence of Cold, and the Extremity of Heat; and moreover, to the end that Divine Creature Man might shew more Graceful and Majestic, by means of this Ornament, deny'd to other Creatures: For,

Turpe Pecus mutilum, turpis sine Gramine Campus;
Et sine Fronde Frutex, & sine Crine Caput.

III. *Here some may Query, Since Hair was given for an Ornament to the Face of Men, why Men are more grac'd with the Ornament of Beards than* *Why Women have no Beards.*

than Women? This comes to pass, because that the first Architect, as he design'd a Distinction between their Instruments of Generation, so was he pleas'd to distinguish between their Ornaments; and therefore he allotted to Man a Beard about his Mouth, which in Women would have been deformed and unhandsom: And to the end there might be no necessity to inspect the Genitals of either Sex, to find the Distinction, which would have been unseemly and shameful: And therefore Boys, before they arrive at Man's estate, are destitute of Beards, till they are able to perform the Act of Manhood, which is Generation. Any other Natural Reason can never be given; for that in both Sexes, the Parts about the Mouth are equally form'd, and yet in those Parts the Mark of Distinction is plac'd as an Ornament, at that very time when there is a necessity for that Distinction; that is, at the time when the Procreative Faculty begins to move, when it is requisite that Boys should be distinguish'd from Maids by some external Mark obvious to the Sight.

The Place where they break forth

IV. *The Hair breaks through the Pores of the Skin, yet not through all the Pores, but only such as are endu'd with a certain Aptitude to suffer that Eruption:* Which Aptitude not being in the Palm of the Hand, nor in the Soles of the Feet, nor in Scars, therefore no Hairs grow there.

Their Roots.

V. *They are fix'd in the Skin with certain little Roots*; and in regard it was ordain'd, that they should be most plentiful in that same part of the Head which is call'd the Hairy part, therefore is the Skin much thicker there than in other Parts of the Body, from whence they give forth less numerous and smaller.

The Division.

VI. *The Hair is divided into Hair brought forth with the Body, and growing afterward.* The Hair with which we are born, is the Hair of the Head, the Eye-lids, and Eye-brows. The other Hair, is that which afterwards appears upon the Face, Privities, Breast, under the Arm-pits, in the Nostrils, Ears, Arse-hole, Thighs, Legs, and other Parts of the Body.

They are Heterogeneous Bodies.

VII. *The Hair is also a Heterogeneous Body, though it seems Homogeneous, as appears from hence, that they live and are nourish'd*: For there is no Life in any Body which is homogeneous and simple; and the Concoction and Preparation of Nourishment, Separation of useful from unuseful, as also Apposition and Assimilation, are necessarily perform'd by the diversity of the smaller Particles. And therefore though *Aquapendens*, and several others affirm this Part to be a Similar Part, yet that is only to be understood in the Gross; not that they are really Homogeneous and Similar, but seem to be so to the Sight.

The Form.

VIII. *The Form of the Hair is two-fold; the one Essential, and the other Accidental.* The Essential Part is that which gives the Hair its Being and Life, which is its Soul. And because this Form is to us unknown, and the Presence of it only perceptible to the Mind, nor can well be express'd in Words. We, with other Physicians (who take their Temper from whence all their Action proceeds, for the Form of the Parts) will likewise agree, *That their Essential Form is their cold and dry Temper.* The Accidental Form of the Hairs, is their Figures and Shape, whatever it be, long, crooked, straight, curl'd, round, square, *&c.* For the Hairs at first Sight, seem solid, and exactly round; yet upon a more narrow Inspection, you shall observe other things. *Spigelius* says they are square, and *Riolanus*, that they are hollow. We also affirm, that the Hairs are porous, and that some are square, others triangular, and other round. For all these Figures manifestly appear, if the Hairs being cut small and short, and well view'd with a Microscope; but the Pores are chiefly extended according to their Length, as you may observe much better in the Bristles of a Hog.

The Efficient Cause.

IX. *The Efficient Cause of Hair, is the same which perfects the Generation of other Bodies*; that is, *a convenient Heat acting upon apt Matter, and disposing it to an Animation proper for Hair.* And though in dead Bodies, in which the Hair will grow for some time, there seems no Heat to remain; yet there is such a Heat, and so much, as is sufficient to promote the Generation of Hair, there being no extraordinary Heat requir'd for that work. Hence the Heat forms, animates and pushes forth Hair out of fit Matter; which being thrust forth by the ambient Cold, become much drier and harder. And hence those Hairs that come into the World with us, because they have remain'd long in a moist place, in New-born Infants, are very

ſoft and moiſt; but the Child being born, they are ſoon dry'd by the Air.

The firſt Original. X. *Concerning the firſt Original of Hair, there is ſome Diſpute among the Philoſophers; while ſome believe 'em form'd in the firſt Delineation of the Parts, out of the Seed; others will not have 'em to proceed originally from the Seed.* The former produce ſeveral Arguments to confirm their Opinion, and do not believe there can be any Queſtion made, but that the Hair which comes into the World with us, is form'd out of the Terreſtrial Part of the Seed, in regard that the Matter of Hair is chiefly Analogous to the Seed; and hence the Subſtance of the Hair born into the World, as alſo the Form and Colour of it, reſembles the Subſtance, Form and Colour of both Parents; and for that Men abounding with Seed, are more hairy, whereas either through much Uſe of Venery, or defect of Seed, they fall off, as in old Age. As to the Hairs that grow after the Birth, they ſay, that it grows from the ſame Seminal Matter ſticking in the Parts which are to be cover'd, and not yet ſtirr'd up into Act; but afterwards, in its own due time, ſwelling through Heat.

The latter ſort, much more to the purpoſe, maintain, That the Hair is not form'd in the firſt Formation, out of the Seed with the reſt of the Parts; but afterwards, when the Parts are already delineated, and ſomewhat grown, that in ſome of thoſe Parts more proper, and more fit for this purpoſe, that ſame peculiar Matter fit for the generation of Hair, increaſes by the Nouriſhment which is brought, and at length out of that Matter agitated by the Heat, the Hair is form'd and ſtirr'd up, being endu'd with a particular Soul and Life diſtinct from the reſt of the Parts, becauſe they are not ſtirr'd up, and endu'd with Life with the reſt of the Parts out of the ſame Seed; but apart, out of other Matter afterwards generated. Now that they live by virtue of another peculiar Vegetable Soul, that has no Communion with the other animated Parts of the Body, is apparent from hence; for that they do live only while a man is alive, but after his Deceaſe, are nouriſh'd and encreas'd, after the ſame manner as *Polypody-Moſs*, &c. grow upon old Trees, both before and after the Tree dies; becauſe they have each a proper Soul, diſtinct from the Form and Soul of the Tree, out of which, and wherein they grow.

The Diverſity. XI. *There is great Diverſity of Hair, which though it be to be obſerv'd in all the Hairs of the Body, yet is chiefly obſervable in the Hairs of the Head for they differ,* First, *in Plenty.*

Hence ſome have very thin and ſmall Heads of Hair; others are very hairy upon their Heads from their Births, or elſe after they are born; and that by reaſon of the great ſtore or ſcarcity of the Matter convenient, which produces the Hair. But as for thoſe who afterwards become bald, that befals 'em not only from the ſmall Quantity, but from the Defect; as in Leprous Perſons, or the unaptneſs of the Matter, or the cloſeneſs of the Pores out of which they grow. Wonderful was the vaſt Quantity of *Abſolon*'s Hair, of whom the Scripture ſays, That *when he ſhav'd his Head, which was but once a year, the Hair of his Head which he cut off, weigh'd two hundred Shekels*; every Shekel, according to the publick weight of the *Jews*, weighing an Ounce.

Secondly, *In Thickneſs.* Hence ſome Heads of Hair are thicker, others thinner, by reaſon of the various bigneſs of the Pores through which they paſs, or the Redundancy or Plenty of Matter.

Thirdly, *In Length.* For ſome Hair grows ſhorter, other Hair grows longer; and generally Womens Hair grows longer than Mens, by reaſon of the Redundancy of Matter, and the Wideneſs and Narrowneſs of the Pores: For if the Pores are over-wide, the Hair falls off, before it grows to any Length; but if ſtraighter, then the Roots ſtick faſter, and plenty of Matter ſupplying their Nouriſhment, they grow in Length.

4ly. *In their external Quality.* Hence ſome Hair is harder, ſome ſofter; ſome curls, ſome hangs lank, and ſometimes dry or moiſt; partly from the various Diſpoſition of the Pores through which they paſs, either in ſtreightneſs, or winding tortuoſity, Hence alſo it is, that ſometimes the Hair ſhoots forth in Buſhes, and without Order; as upon the Head, Privities and Beard; in other places orderly, and as it were in a perfect Row, as in the Eye-lids.

5ly. *In Colour.* Hence ſome are red-hair'd, others black, others white, others grey, and others of a midling Colour between both.

XII. *This*

The reason of the Colours.

XII. *This Variety of Colours proceeds from the Variety of Humors that are mix'd with the Juice with which the Hair is nouriſh'd; with which, if Flegm be mix'd, the Hair becomes white*; and therefore Flegmatic People, who are of a cold Temperament from their Births, are generally white-hair'd. If Smoaky Vapors, either through over-much Heat, and burnt with too much Concoction, are mix'd therewith, then the Hair becomes black. Hence thoſe that are of a hot Conſtitution, and concoct their Meat well, and therefore breed thoſe fuliginous Vapors in great abundance, are generally black-haird; if yellow Choler be mix'd therewith, then they become red-hair'd: If Flegm abounds in one part of the Skin, Fuliginous Vapors, or Choler in another, the Hair will be of ſeveral Colours; in one place white, in another black or yellow: And thoſe Colours, proceeding from the ſame Humors, ſetled in the Skin, then alſo many times, as in Brutes, the ſame Colours are imprinted in the Skin; whence *Ariſtotle*, not conſidering thoſe Humors ſetl'd in the Skin, and giving it a Colour, affirm'd, That *the Skin conduc'd to the colouring of the Hairs, and that they were of the ſame Colour with the Skin.* Thus you ſhall ſee ſome grey in one part of the Head, in another black-hair'd; and in Dogs and Horſes of ſeveral Colours, we ſee the ſame Colours, as well in the Skin, as in the Hair; becauſe the ſame Colours were imprinted in the Skins of thoſe Creatures, at their firſt coming into the World; which Colours remain as long as the ſame Humors are ſetled in the Skin; with which, if afterwards other Colours happen to mix, then the Colour changes. Thus in Horſes and Dogs of ſeveral Colours, when they grow old, by reaſon of the Increaſe of Flegm, and its more copious mixture, the Hairs grow white, and the Spots that were black before, grow grey. Hence alſo it is apparent, why the *Egyptians*, *Arabians*, *Indians*, *Spaniards* and *Italians* are generally black-hair'd; becauſe they inhabit hot Countreys, and are us'd to ſtrong Wines, and other hot Diets; by which Heat a greater Quantity of burning Vapors are generated; which being mix'd with the Alimentary Juice of the Hair, imprint that Colour into it, which is thence alſo given to the Hair. Whereas the *Engliſh*, *Hollanders*, *Scotch*, *Danes*, and other Northern Countreys, are generally bright-hair'd; becauſe they inhabit colder Countreys; whence there is great ſtore of Flegm generated in their Bodies, which gives a whitiſh Tincture to the alimentary Juice of the Hair; & thence it is that there are few People who are truly black-hair'd; but ſeveral, who, till they come to be middle-ag'd, are between a White and a Black. Add to this, that in thoſe Countreys, the greateſt part ſooner grow Grey; whereas in hotter Countreys the People are not Grey ſo ſoon.

Now, that this is the true Cauſe of the variety of Colours, and change of the Colours of the Hair, is apparent from hence, for that the Hair does not always keep the ſame Colour which it was of in the Infancy of the Perſon; but changes according as the Temper of the Perſon changes, or as other Humors are generated in the Body. Thus *Marcellus Donatus* tells us a Story, of one that in the Declination of his years, at what time he was quite grey, by the mixture of great ſtore of Choler abounding in his Body, with his Blood, not only his Skin contracted a Gold-Colour, but that alſo all his grey Hairs loſt their Greyneſs, and became of a Yellowiſh Colour inclining to Green.

But hence I would not have it concluded, that the Hair is generated out of theſe Flegmatic, Sanguine, Choleric or Aduſt Humors, or that they are nouriſh'd by them, as a proper Nouriſhment: For they are generated, and receive their Nouriſhment from a Specific Juice, or Humor, prepar'd after a ſpecial manner; which they take from the Part wherein they are ſetl'd, which prepares that Humor out of the Blood, or ſome other Humor flowing to it. But this is that which I mean, That the Colour of the Hair proceeds from the mixture of this or that Humor with the nouriſhing Juice. Hence it is that *Hippocrates* has left it for a Maxim, That whatever Moiſture the Skin has attracted, whether white, red, or black, the Hair is always of the ſame Colour. In this Sence *Alexander Aphrodiſæus* writes, that ſometimes the Hair will be almoſt of a Golden Colour, if yellow Colour happens to be mix'd with Flegm; that is, when thoſe two Humors are mix'd together with the Alimentary Juice of the Hair. Thus as a Man begins to encline toward old Age, the Hair becomes more and more grey and white, not from the defect of Alimentary Matter, but becauſe of the colder Conſtitution, greater ſtore of Flegm is generated in the Body, and mix'd with

that

that Juice wherewith the Hair is nouriſh'd, and cauſes it to turn white.

Why the Hair of the Head firſt grows grey.

XIII. *Hence it is manifeſt, why the Hair of the Head ſooner grows grey than upon the Privities, under the Arms, or upon the Thighs,* &c. Becauſe that in no Part of the Body, there is ſo much Flegm generated as in the Head; which being infus'd into its Skin, cannot chuſe but ſettle more abundantly in the Alimentary Juice of the Hair, in aged People, than in young Folks, who leſs concoct and diſſipate more the crude Humor. From which Flegm more cloſely mix'd, the white Colour is given to the Matter, and by that to the Hair. But in the other Parts, as in the Privities, Arm-pits, *&c.* which are hotter, the Flegm happens to fix later, and for that reaſon the Hairs become later grey in thoſe Parts.

Signs of the Temper of the Body.

XIV. *The* Galeniſts, *from the Colour of the Hair, make ſeveral Judgments of the Tempers not only of the Skin, but of the whole Body.* Thus, a White colour indicate a Flegmatic; a Red, a Choleric; a mixt Colour denotes a midling Temper. Nay, ſometimes occult Diſeaſes alſo, and the Conditions of the Mind are diſcover'd by the Colour and Conſtitution of the Hair. Thus the Diſeaſe and Cure of the Leproſie, which is deſcrib'd in the Old Teſtament, was chiefly diſclos'd by the Colour of the Hair. Long, ſlender, and ſtreight Hair denotes a mild and courteous Diſpoſition; curl'd Hair an inconſtant and teſty Diſpoſition, and Quickneſs and Chearfulneſs in undertaking of Buſineſs: Soft Hair betokens Puſilanimity; harſh Hair, eſpecially inclining to Black, Reſolution of Mind, and Strength of Body.

——Duræ per brachia Setæ
Promittunt atrocem Animum.

After all theſe things, that there may be nothing wanting in reference to the Diſcourſe of Hair, let us enquire what is the Matter out of which Hair is generated, ſeeing that we have already ſhew'd, that it is not generated out of the Seed at the firſt Formation of the Birth.

The Materials of Hair.

XV. *This Matter then is a certain thick, terreſtrial, viſcid Juice, bred out of the Blood, or ſome other Humor, and prepar'd after a Specific manner.* That the Matter is thick and terreſtrial, appears from hence; that is to ſay, from the hardneſs, the viſcouſneſs, from the firmneſs and flexibleneſs of the Hair.

The manner of its Generation.

XVI. *Out of this Matter, or out of this Juice, in the Parts adapted for the generation and fixing of the Hair, is the Hair generated, animated and ſhot forth by the agitated Heat, and afterwards nouriſh'd after the ſame manner.* For this Juice is attracted by the Roots of the Body, and carry'd through the Pores to the Extremities, & ſo nouriſhes the Hair, and paſſes into its Subſtance, as we may obſerve in the Nouriſhment of Plants.

This Juice, I ſay, is concocted and prepar'd in certain Parts, out of which the Hair ſhoots, and that at what time thoſe Parts are become fit for the Preparation of this ſort of Matter; which Aptitude, when ſome Parts obtain ſooner, others later, hence it comes to paſs, that the Hair grows ſooner in ſome Parts; as upon the Head, Eye-lids, and Eye-brows; in others, later; as upon the Chin, the Privities, the Breaſt, the Arm-pits, *&c.*

Whether the Kernels afford Matter for the Hair.

XVII. *Riolanus*'s Judgment is otherwiſe concerning this Matter; who thinks this Juice is not prepar'd in the Parts which are to be cover'd, but endeavors to prove, that the Matter of the Hair is afforded only from the Kernels. *Beſides the Aptitude of the Skin,* ſays he, *there is requir'd a certain Glandulous Subſtance, as well to moiſten the Skin, and to afford Matter for the Generation and Nouriſhment of the Hair; wherefore where the Parts are ſlimy and moiſt, there are alſo Kernels; for proof of which, we find, that where there are Kernels, there is alſo Hair. The Hair therefore taking this Opportunity from the Kernels, grows and increaſes, collecting that which abounds and flows into the Extremities; but where the Body is dry, and no Glandules are, there grows no Hair. Moreover, there are Kernels on both ſides the Ears, near the Jugular Veins of the Neck, and Hair alſo in the ſame Place. Alſo under the Arm-pits on both ſides, there are Kernels and Hair: But the Brain is bigger than all the reſt of the Glandules, and therefore there is more Hair upon the Head.*

But though this be a ſpecious Argument of *Riolanus*, as propounded according to the Opinion of *Hippocrates*, yet it reſts upon no ſolid Foundation. Rather the contrary will follow, ſhould we thus argue; *Where there are no Glandules,*

dules, there is no Hair; which that it is falſe, many Proofs declare. For there are no manifeſt Glandules under the Skin of the Legs, which are nevertheleſs very hairy in moſt Men. Moreover, in Men they abound upon the Chin and Lips, where there are no Kernels of any moment to be found. And therefore *Riolanus* vainly endeavors, to force his Matter from remote Kernels near the Ears, and others under the Tongue, to create Hair upon the Lips and Chin. Moreover, Hair has been obſerv'd to grow in the Heart, where never any Glandules were yet known to be. It has alſo been found that Hair has grown upon dry'd Carkaſſes; for the Generation of which, the dry'd up Kernels can afford no Matter moſt certainly. Moreover, if the Kernels afforded that ſlimy Matter for Hair, and *Riolanus*'s Rule were true, *Where there are Kernels, there is alſo Hair*; why does not Hair grow in the ſame Parts of Women, ſeeing they have as many Kernels as Men? Why have they no hair upon their Chins and Lips, like Men? Why are not their Breaſts hairy alſo like Men's; ſeeing their Breaſts are full of ſuch large Kernels, ſo that by that Reaſon they ought to have the moſt Hair in thoſe Places? In the laſt place, *Riolanus* does very ill to number the Brain among the Glandules; as we ſhall ſhew in the Fifth Chapter following.

Whether the Matter of Hair be an Excrement.

XVIII. *But* Galen, *and with him, many other Phyſicians and Philoſophers diſſent from our Opinion firſt propounded, and the Doctrine of* Riolanus, *who believe, and teach, That the Matter out of which Hair grows, and is generated, is no peculiar Juice, to that end ſpecifically prepar'd in the Parts to be cover'd, or ſupply'd from the Glandules, as* Riolanus *aſſerts; but that it is an Excrement of the third Concoction, moiſt, fuliginous, thick, and terreſtrial, rais'd from the Fat which lies under the Skin, or from ſome ſlimy and viſcous Humor, that lies in like manner under the Skin, and ſticks to it; which being apply'd to the Roots of the Hair, ſhoots forth by degrees the preceding Particles, and cauſes 'em to grow long.* From which Opinion of his, they thus conclude, That no Nutritive Matter paſſes through the Hair it ſelf to its Extremities; but that their Growth is caus'd by the ſaid Appoſition to the Roots; which is the Reaſon that they do not grow all of an equal dimenſion. *Secondly*, That the Hair is not to be numbred among the Parts of the Body, partly, becauſe it is not nouriſh'd with alimentary Juice, but by fuliginous Vapors: partly, becauſe they have not a Soul and Life common to the reſt of the Parts. And hence the Hair being cut, or pull'd up by the Roots, a man is not deem'd to be depriv'd of any Part of his Body; and for that they live after a Man is dead, and depriv'd of his Soul, or at leaſt for ſome time.

Objections.

XIX. But this Opinion is oppos'd by others, with many ſtrong Arguments.

1. If the Hair were generated out of any ſuch fuliginous Vapour, then in ſane Bodies, full of good and wholſom Humors, where there is leaſt of this ſort of Excrement, there would little Hair grow; in Bodies full of peccant Humors, a great deal of Hair. Whereas Experience teaches us, that the Hair grows beſt in ſoundeſt Bodies, and fulleſt of good Juice; but that in Bodies full of peccant Humors, it grows very thinly, and falls off; which cauſes that Diſeaſe call'd *Alopecia*, or *Falling of the Hair*; which is cur'd by Med'cines that evacuate peccant Humors; and by good Diet, that creates good Blood, and conſumes fuliginous Excrements.

2. That the Hair is not nouriſh'd by any ſuch Excrement, or increas'd by its Appoſition, appears from hence; for that the Hair being cut, and conſequently made obtuſe at the end, would remain obtuſe; whereas the contrary is apparent; in regard the hair grows firſt at the Ends, and becomes ſharp.

3. The ſame thing is alſo manifeſt from hence; That if you pluck up the hair by the Roots, you ſhall find many times ſomething of Blood ſticking to them, out of which, being concocted in the Skin it ſelf, and prepar'd after a Specific manner in the hairy Parts, is made that ſame Juice which nouriſhes the Hair, and by degrees paſſes through the Cavities and Poroſities of the Hair it ſelf, to its extream Parts, for the Supply of Nouriſhment: Which is much more manifeſt in the *Plica Polonica*, a Diſeaſe ſo call'd; wherein, upon the cutting away the Hair, the Blood is ſaid to flow out; queſtionleſs much more crude, as not being chang'd as yet into any ſuch Juice in the Skin. Now concerning the foreſaid Cavities of the Hair, there is no queſtion to be made of 'em; for that they are extended inwardly to the full length of the Hair, is manifeſtly

manifeſtly ſeen, if being cut into ſmall pieces, they be well view'd with a Microſcope; which may be eaſily diſcern'd in the Hair of a live Elk, as *Geſner* obſerves. Moreover, the Hair is nouriſh'd after the ſame manner as the Feathers of Birds; for it is almoſt of the ſame Nature. Now the Quills contain in themſelves, and make an Alimentary Juice, in a certain Cavity which extends to their Ends, and what if the Hair have ſuch a Cavity? For this Juice ſeems to be made in the Quills out of the Blood, in regard that every Quill has a little Artery extended into the Cavity. And thus the Hair may have a peculiar Juice and Cavity, through which that Nouriſhment is carried to the Ends of it, whether it be generated out of the Blood, or other Humors.

4. If the Hairs growing grey through Sickneſs, afterwards return to their Natural Colour, certain it is that they are not put forth by Appoſition, but are really nouriſh'd through the whole Subſtance: As appears from hence, that when the Hairs begin to grow grey, they grow firſt white at the end, and ſo gradually to their furtheſt extent toward the Head. Whereas otherwiſe, if they were nouriſh'd by Appoſition, that Whiteneſs would begin at the Root, and that Blackneſs which was before in the Hair, would remain, and another white Part were to be appos'd by degrees. Nor is it leſs apparent from hence, that ſome Men have become grey in one Night, the nouriſhing Humors being chang'd of a ſudden through the whole length of the Hair.

5. That the Hair is ſaid not to grow forth according to all Dimenſions, is not true; for though they chiefly grow in length, yet there is ſome growth and increaſe obſerv'd in breadth; for we find, that ſome ſlender and ſoft hairs become afterwards thicker and harder; eſpecially in the Beard. Thus in young Girls whoſe Hair is very ſlender and ſoft, yet afterwards, though they never cut their hair, it comes to its juſt Thickneſs and Length; which Bounds of Thickneſs they never exceed, no more than the Teeth, Bones, Veins, and other Parts; which having receiv'd to their full Growth, make a full Stop, and grow no more: There being a certain Bound of Magnitude, and a certain Shape preſcrib'd to every Part by the Supream Creator; whence it comes to paſs, that the Hair does not grow ſo much in Breadth as in Length.

6. If the Hairs were nouriſh'd with a fuliginous Excrement of the Third Concoction, they would increaſe to an immenſe Length, and would grow continually as long as a Man liv'd; for there is a continual Flux and Supply of that Excrement; and ſo being appos'd to the Roots, it would thruſt forth the hair ſtill farther and farther. But on the other ſide, we ſee that the hair, when it has attain'd to a certain Length, grows no farther, as we find in Women, who never cut their hair; as alſo by the hairs of the Legs, Breaſt, Privities, and other Parts.

Theſe Arguments have fix'd an Opinion in the Minds of many, That the Hair is really a Part of the Body, and enjoy the ſame Life and Nouriſhment with the reſt of the Parts.

XX. *But if the Reaſons on both ſides be well weigh'd and conſider'd, we ſhall find that the former Opinion is for the moſt part to be rejected; and yet there are ſome things deficient in the latter, which is the trueſt.* *The Reſolution.*

For, in the *Firſt Place*, it is well alledg'd, That the Hair is not thruſt forth by the only Appoſition of any Matter, but that they receive Nouriſhment through their whole Subſtance. But here they do not explain, how the Hair ſhould turn grey of a ſudden by ſuch a Nouriſhment.

Secondly, They do not ſhew, whether the Hair be to be call'd a Part of the Body or no. Neither do they unty this Knot, How any Part of the Body can live and grow after a Man is dead? And therefore theſe two Doubts are to be more clearly unfolded.

XXI. As to the Firſt, *Sometimes that Men, out of extream Terror or Fear of Death, in the ſpace of a Night or a Day, have turn'd grey; is moſt certain:* Which I was an Eye-witneſs of, in a certain Captain taken by the Enemy, and fearing to be hang'd the next day. And Story is full of Accidents of the ſame Nature; as we may read in *Suetonius*, *Nicolaus Florentinus*, *Crantzius*, *Scaliger*, *Adrianus Funius*, and others; Collected by *Marcellus Donatus*. *Turning Grey of a ſudden.*

XXII. *The Cauſe of this ſudden Alteration; ſome have aſcrib'd to a ſudden Dryneſs; others, to a ſudden Putrefaction of the Humor nouriſhing* *The Reaſon.*

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ing the Hair; but neither of these Causes can be the true one, since neither can happen so suddenly. Therefore I judge this to be the Reason: Upon a great Fear and Terror conceiv'd in the Mind, the Heart by accident is extreamly troubled and perplex'd; and hence there is a weak, or no Pulse at all; so that some People fall into a Swoon; now by reason of this weak Pulse, little or no Blood is carry'd to the extream parts, so that they grow cold, and shiver; then the Blood failing in the Heart, the Colour may be soon changed in the Juice that nourishes the Hair, which was conveigh'd into it before by the humors mixed with the Blood. So that if by chance the Flegmatic Whitish humors were setled in the Skin before, they by the predominancy of their Tincture, give a Dye to the Juice that nourishes the Hair; which continually passing through, and nourishing the Hair to its utmost extremity, the Colour of the Hair may be changed in a short space, and become grey or white, because the substance of the Hair is diaphanous, easily admitting all sorts of Colours, which are carried into it with the Nourishment. But if no Flegm stick at that time in the skin of the Head, but that some other fuliginous blackish Humor, or of any other Colour be there more firmly setled, then no sudden greyness can be the consequence of the greatest Terror imaginable: And therefore because more frequently fuliginous and choleric Vapors or other Humors are setled in the Skin, hence it comes to pass, that so few grow grey upon any sudden fright. But perhaps it may be objected, That if this be the cause of suddenly growing grey, then when the Fear and Terror is over, and that other Humors have their free course to the Skin of the Head, that Greyness should suddenly vanish again, and the Hair would resume again its pristine colour. 'Tis granted, that if they could flow back in so great a quantity, that they could with their own colour out-tincture the white colour of the Flegm: But for the most part by reason of the extream scarcity of the Blood flowing in time of dismal Affright, the pores of the Skin are so closed and contracted by the Flegm, that the more copious quantity of Blood afterwards flowing thither, or whether it be any other fuliginous, blackish or choleric Humor cannot enter to discolour the Flegmatic Humor; which is the reason that grey colour cannot afterwards be altered. Though if it should happen that there should be any persons in whom those forementioned Humors should get the upper hand of the Flegmatic colour, which rarely falls out, the Hair, 'tis very probable might then regain its former Tincture. This I saw in the Captain before mentioned, whose Hair in one Nights imprisonment, from very black, became as white as Snow; but afterwards that Whiteness in some measure, and by degrees lost its colour, so that in two years time, almost all his Hair was turn'd black again: I say *almost*, for that he could never recover all his former colour, but that still a fourth part of his Hair continu'd still grey. The same thing also happened to that person already cited, of whom *Marcellus Donatus* reports, that he was all over grey; but that afterwards being overflown with Choler, his Hair became of a colour between green and yellow.

The same Accident has been observed up and down in others; in whom, by reason of the redundancy of Humors, that Greyness which before had whitened all their Locks, was changed into another colour.

Whether Hairs be Parts of the Body.

XXIII. *As to the latter, Whether the Hair be to be numbred among the Parts of the Body, there needs no great Dispute.* For in several respects they may be called Parts of the Body, and sometimes not, according to the various Definitions of a Part. For if we put the Definition thus; *A Part of the Body is any Corporeal Substance, making it compleat and entire with others*, then Hair may be said to be a Part of the Body; for that really and indeed together with other Parts, compleats and perfects the Body of Man; as Leaves make a Tree, and Feathers a Bird. For as a Tree without Leaves, and a Bird without Feathers, can neither be said to be perfect, so a man without Hair, cannot be said to have all his Accomplishments, though he may live without it. But if we otherwise define a Part, *A Part is a Body cohering with the whole, and conjoyned by common participation of Life, appropriated and ordained to its Function and Use*, then Hair can hardly be said to be a Part of the Body; for though they live, yet they do not live

the common Life of the reſt of the Parts, but a peculiar vegetable Life; as Moſs or Polipody growing upon a Tree, lives a ſeparate Life from the Tree, though it receive it's nouriſhment from the living Tree. Now the difference of its living appears from hence, becauſe that though the Tree be dead, yet the Moſs ſtill lives, ſo long as it can receive any convenient Nouriſhment from the Tree, or elſewhere. In like manner, the Hair, ſo long as it receives convenient Nouriſhment from the Body, either alive or dead, lives its own peculiar Life; which Life, that it is not common with the reſt of the Parts, is prov'd from hence; for that Death is not common to the Hair with the reſt of the Parts: For the Soul departing, all the Parts die that were enlivened with the ſame Soul; but not the Hair, as growing after the Death of Men, by virtue of that peculiar Soul wherewith they are endowed.

Now becauſe the Hair is nouriſhed with the Blood in living men, this does not prove that they are Parts conjoyn'd by common Life; for they are not nouriſh'd immediately by the ſame Blood, but by a peculiar Juice, which in living Men is made out of the Blood; yet may be alſo prepar'd out of other Humors, as appears by the Woman before mention'd; out of whoſe Ulcer, filthy and ſtinking, there grew a great quantity of Hair: And as is alſo manifeſt in dead Bodies, in which a long time after they have been laid in their Graves, when there could be no Blood remaining, the Hair has been obſerv'd to grow. Which is a certain ſign that that ſame Nouriſhing Juice was not generated out of the Blood, but out of ſome other Humor remaining in the Body, which not being overmuch in dead Bodies, therefore the Hair does not grow ſo faſt in them as in living Bodies. Moreover, as the Birth which is nouriſh'd by the Umbilical Blood through the Navel, by means of the Cheeſe-cake, adheres to the Mothers Womb, is nevertheleſs no part of the Mother, but rather a living Body by it ſelf, begot in the Mother, which in the Womb enjoys the Maternal Blood as Nouriſhment, as alſo the Milky Juice; but afterwards being expell'd, the Womb ſhall be no leſs ſufficiently nouriſh'd, and live without that Blood and Milky Juice, and all this while the Mother remains entire, and undeprived of any Part that contributes to her Perfection, the ſame is to be thought of the Hair.

So that the Queſtion, Whether the Hair be a Part of the Body, is only a Queſtion and Controverſie about the Definition of the Part.

XXIV. *But becauſe mention has been made concerning Hair growing in dead Bodies, we ſhall ſpeak ſomething to this Particular.*

Ariſtotle ſays, that the old Hair grows in dead Bodies, but that no new Hair comes again; ſo *Plotin* writes, that the Hair and Nails of dead Bodies, grows. We ſhall not trouble our ſelves to recite the ſeveral Diſputes of ſeveral Phyſicians and Philoſophers upon this Subject; but only produce our own Judgment, confirm'd by the Teſtimonies and Obſervations of ſeveral Phyſicians. Among the reſt, I muſt not omit *Ambroſe Paræus*; who writes, that he kept the dead Body of a Thief that was hang'd, in his Houſe, by him, embalm'd, and dry'd it, to preſerve it from putrefaction; whoſe Hair and Nails, being by him ſeveral times cut and par'd, he obſerv'd to grow again to their uſual Length. But I need not the Teſtimony of *Paræus*, tho a Perſon of great Credit, as having been a Witneſs of the ſame much nearer home.

An Obſervation.

XXV. In the Year 1636. the Plague raging at *Nimeguen*, where I then practic'd, one of the chief Magiſtrates Children dying of the Diſtemper; which the Father, after all his other Vaults were fill'd with his Relations, was reſolv'd to bury in a Third of his own, that had not been open'd in 78 years, for the Burial, as I think, of his Great Grandfather; at the opening of which Vault, he deſir'd me to be preſent, and to ſee whether the Body were dried up, as other Bodies bury'd in the ſame Church, were obſerv'd to be. Thereupon, opening the Coffin, we found the Body whole and entire, only the Cheeks were a little fallen; the reſt of the Members lay in their natural poſition; and long hairs grew out of the Shoulders, of a pale yellowiſh Colour. A broad long Beard alſo reach'd down to his Navel, of the ſame colour with the hair; though by the Picture which was ſhew'd me, he wore the hair of his Head and Beard very ſhort when he was alive.

I alſo obſerv'd, that when I went to turn the Carkaſs with my hand, the whole Body, except the Bones, fell into a thin duſt, which after we had taken out the Bones, and caus'd 'em to be bury'd again, we likewiſe found to be

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ſo ſmall in quantity, that you might have grasp'd it all eaſily in one hand; though it were the whole Complement of the Carkaſs.

Whether ſtore of Hair contribute ſtrength to the Body.

XXVI. Laſtly, *By way of Corollary, I ſhall only add one thing more; Whether great ſtore of Hair conduce to the Strength of the Body?* *Levinus Lemnius* maintains the Affirmative; and therefore adviſes ſound People never to ſhave their Hair to the Skin. *For*, ſays he, *the Uſe of it, deſtroys the Strength, and renders Men ſoft and effeminate; beſides, it diſſolves and extenuates the Spirits and Natural Heat, and deprives the Heart of a great part of its Courage and daring Boldneſs to look danger in the face.* And the Story of *Sampſon* in Sacred Scripture, ſeems to favour *Lemnius* his Party; who loſt his extraordinary Strength upon the ſhaving of his Hair, and recover'd it, upon the growing again of his Hair. On the other ſide, we find the *Romans* ſhav'd their Wreſtlers to the very Skin, to render them more ſtrong and lively. However, for my part, I am of opinion, that great ſtore of Hair conduces little to the ſtrength of the Body, but much to the health of the Body, while the Head is thereby cover'd and defended from many external Injuries. But the Head, together with the Brain, being ſound, great ſtore of Animal Spirits are generated, which gives ſtrength to the whole Body of the Nerves and Muſcles, and ſo great ſtore of Hair may ſeem to add to the ſtrength of the Body. But this can be no univerſal and perpetual Rule; becauſe there are many, in whom great ſtore of Hair prevents the Tranſpiration of the Vapors, and conſequently weakens the Brain. For this ſame Tower of *Pallas*, being darken'd by Clouds of Vapors, the generation of Animal Spirits is thereby obſtructed, and thereby the Nerves and Sinews are weaken'd; beſides that it is many times the occaſion of Catarrhs and other Diſeaſes. For this reaſon, to quicken the Sight, *Ruates* and *Avicen* commend Shaving of the Head; and *Celſus*, in great Defluxions of Rheum, orders the Head to be ſhav'd. For which Reaſon, *Ariſtotle* alſo was wont to ſhave the top of his Crown. And *Galen* reports, That the Phyſicians of his time were wont to ſhave to the Skin, for the Preſervation of their Health. And beſides, Women, by reaſon of their great ſtore of Hair, are never accounted ſtrong. To conclude therefore, we may ſay, that plenty of Hair is ſometimes a ſign of Strength, and ſometimes the occaſion of Weakneſs and Diſtempers, according to the Conſtitution of the Body. Though they that have hairy Breaſts, and Skins, are generally reputed ſtrong; not that the Hair confers any Strength upon the Body; but 'tis a ſign the Heart and other Bowels are ſound and ſtrong; and then the reſt of the Body muſt be ſtrong of courſe.

CHAP. III.

Of the External Coverings of the Head.

After the Hair, follow the reſt of the External Coverings of the Head:

I. *Of which, the firſt that offers it ſelf, is the* Cuticle, *then the* Skin, *which in the Hairy part is of an extraordinary thickneſs, to defend the Head from external Injuries, and that the Hair may have the deeper and firmer Rooting.* *The Skin.*

II. *Under the Skin lies a ſmall quantity of Fat; but not too much, leſt it ſhould prevent the Tranſpiration of the Vapors.* *Riolanus* will not allow of any Fat. *Fat.*

III. *Under the Fat, lies the fleſhy Pannicle; and under that, ſeveral Muſcles, to be treated of in another Place.* *Fleſhy Pannicle.*

IV. *Next to theſe, lies the* Peri-cranium, *which is a thin, ſoft, cloſe, compacted and ſenſible Membrane, by reaſon of the Nerves diſperſed through it and the Temples, to the hinder part of the Head.* This encompaſſes the whole Skull, and is cloſely joyned with Sutures and nervous Fibers, running down through the joynings of the Bones to the hard *Meninx*, and united with it, whence there is a great agreement of the Membrane with both; Inſomuch that the *Pericranium* is vulgarly ſaid to derive its original from the *Meninx*: from which Opinion *Spigelius* & *Highmore*, not without reaſon differ; who deny this original, and only acknowledg a connexion of both by *The Peri-cranium.*

nervous Fibers. *Lindan* seems to deduce the original of the *Pericranium* from the Tendons of the Muscles of the Forehead, Temples, and hinder part of the Head, expanded about the *Cranium*; which seems less probable, seeing that the *Pericranium* is extended above the Muscles of the Temples, and their Tendons, and cannot be drawn off without their prejudice. *Fallopius* says, the *Pericranium* is twofold; and in some parts of the Head may be divided into two parts; of which, the one sticks to the Skin, the other grows to the Bone. But *Vesslingius* will not allow of this Duplicity, nor could we ever as yet observe any such thing.

Above, before and behind, it encompasses the *Cranium*, only the *Periostium* between. Only descending to the sides, it parts a little from it, and passes over the *Temporal Muscles*, and comprehends 'em within it self, for their greater security; not so far as their insertion, but as far as the Jugal Bones; and in those places it is thicker and harder.

The Periostium.

V. *Under the* Pericranium *lies the* Periostium, *which is a very thin nervous Membrane; by the benefit of which, the Skull becomes sensible, as all other Bones, except the Teeth, which have their sense of feeling partly from the* Periostium, *investing the Roots, and partly from an inner little Nerve.*

This as it is firmly fasten'd to the *Cranium*, so also it is so exactly joyn'd to the *Pericranium*, that it seems to make but one Membrane; which deceiv'd *Fallopius*, who thought it to be but one; which made him write, that the *Pericranium* was the same in the Head as the *Periostium* in other Parts; forgetting that the *Periostium* never passes over the Muscles, as the *Pericranium* mounts over the *Temporal Muscles*. But Anatomical Separation shews them to be two distinct Membranes.

To these exterior Membranes, the Vital Blood is carry'd through the external Branch of the Carotid Arteries, and that which remains after Nourishment, through very small Veins is remitted to the external Jugular. Some there are who believe these Arteries, passing through the little holes of the *Cranium*, penetrate and open into the large Cavity of the hard *Meninx*. Which however does not seem very likely, when they only tend to the *Diplois*, and there end, conveying the Blood thither, for the generation of the Spinal Marrow; but never return from the Bones again.

Bones.

VI. *The* Periostium *adheres immediately to the Bones of the Head, which are either of the Skull, or of the Jaws,*

The Bones of the Cranium, *are the Bones of the Forehead, forepart and hinder part of the Head, the* Sphœnoides, *and the Bones of the Temples.*

The Bones of the Jaws are many, and have most of them peculiar Names. Of which see *l.* 9. *c.*3. &c.

CHAP. IV.

Of the Internal Coverings of the Brain: of the Scythe, and the Cavities.

THE Cranium *being taken off, the inner Parts are to be seen; among which are first to be met with two Membranes, most acute in feeling; by the* Greeks *call'd* Meninges; *by the* Arabians, *Mothers, which careful Nature wrapt about next to the Brain, for the preservation of that most Noble Bowel.*

Dura Meninx.

I. *The outermost, which does not enfold the Brain immediately, is from the Thickness and Hardness of the Substance, by* Galen *call'd* Σκληρὰ, or Παχεῖα; *the thick or hard* Meninx, *by* Hippocrates, Παχυτέρη, *by others,* Dura Mater, *or the* Hard Mother, *endu'd with a most exquisite sense of Feeling.*

This several *Anatomists*, together with *Fallopius* and *Paulinus* think to be twofold; but because the Duplicature is not easily discern'd, therefore *Riolanus* rejects it.

It was fram'd by Nature, not only for the preservation of the Brain, Marrow, and Nerves, but also to distinguish the Brain into two parts, as also from the *Cerebellum*.

It loosly wraps about the Brain, as far distant from it as the conveniency of

of Motion will ſuffer. It alſo ſurrounds the whole inner part of the *Cranium* with a looſer Folding, ſo that in ſome places it may be remov'd from it, as is uſual upon trepanning the Skull by a ſoft depreſſion; but at the bottom it is moſt cloſely knit, that it cannot eaſily be ſeparated from it, and is firmly faſten'd to the Sutures by Fibers, and about a Fingers breadth at the ſides of the Sagittal Suture, and many times near its meeting with the Coronal, by the means of ſmall Veſſels, which it ſends forth toward the *Diploïs*, it ſticks in two, three, or four places; in which places, when the *Cranium* is pull'd off, certain little drops of Blood ſtart out of the broken Veſſels. Once *Varolius* ſaw one growing to the whole Skull, which is very rare; though twice obſerv'd by *Hildan* alſo.

Its Holes. II. *It is pervious with many Holes, for the paſſage of the Veſſels, and one large one, for the deſcent of the Marrow; and one more as large toward the Spittle-Kernel. But where it ſticks to the Sieve-like Bone, it is perforated like a Sieve, or rather ſends little Pipes to the Noſtrils through the ſmall Holes of the Bone, manifeſtly conſpicuous in the Head of a Calf.*

On the out-ſide it is rougher and harder, encompaſſing the *Cranium* and its Cavities, and with ſeveral Fibers tranſmitted through the Saw-like Sutures, ſticks to it; of which Fibers expanded on the out-ſide, about the *Cranium*, ſome believe the *Pericranium* to be made. On the in-ſide, it is ſmooth and ſlippery, bedew'd with a watery Humor; and by means of the Veſſels, it ſticks in many places to the thin *Meninx*.

Its Veſſels. III. *It receives Arteries from the larger Branch of the Carotid Artery, paſſing through the holes of the Wedg-like Bone, and the Bone of the Forehead, which, in ſome places, eſpecially in the Region of the Crown, ſtarting out of this Membrane, ſupply the thin* Meninx *with Branches; by means of which, theſe Membranes ſtick one to another. It alſo ſends ſtore of Veins to the Cavities, and the Branch of the Jugular Vein.*

Its Duplicature. IV. *It is doubled at the Crown of the Head; where deſcending toward the inward Parts, it divides the Brain into the right and left Part.* This uppermoſt doubl'd part, becauſe it is broader toward the hinder parts, and contracted toward the fore-parts, and ſo ſeems to repreſent the ſhape of a Mower's Scythe, is call'd *Falx*, or the *Scythe*.

V. *The* Falx, *or* Scythe, *with the fore-part of it runs to the top of the Noſtrils, and grows to the Cocks-comb, or the Bony Encloſure, diſtinguiſhing the Papillary Proceſſes. But the hinder and broad part of it, being parted in the hinder part of the Head, deſcends toward the right and left ſide, and diſtinguiſhes the* Cerebel *from the Brain.* In which place, there is a Bone ſticks out in Dogs, that ſupports the Brain, leſt the *Cerebel* ſhould be compreſt by it. *The* Falx *or* Scythe.

Riolanus will allow no Duplicature of the *Meninx* in the *Falx*, nor in the Encloſure between the Brain and the *Cerebel*, which nevertheleſs the Cavities form'd in the ſaid Duplicature, ſufficiently prove.

VI. *In the ſaid Duplicature, are four* Cavities, *three larger, and one ſmall one; the inward Hollowneſſes of which larger Cavities are not large alike; but by reaſon of the many Veſſels that open into them, are ſomewhat unequal; as being broader in ſome places, in ſome places ſomewhat narrower.* *The* Cavities.

The firſt of theſe Hollowneſſes, being the uppermoſt and longeſt, runs along the upper part of the *Falx*, from the top of the Noſtrils, the whole length of the Head toward the hinder parts, where it is divided into two lateral hollowneſſes at the bottom of the hinder part of the Head deſcending near the ſides of the *Lambdoides*, and continu'd with the inner Branch of the Jugular Vein.

VII. *Where theſe Hollowneſſes meet, there is that which is vulgarly call'd* Herophilus's *Wine-Preſs, or the* Torcular Herophili. *Torcular Herophili.*

But although theſe Hollowneſſes meet equally, yet ſometimes their meeting is found to be unequal; ſo that one of the inferior lateral ones enters the ſtreight one a little higher, and the other a little lower.

Beſides

Beſides the foreſaid Hollowneſſes, *Sylvius*, and ſome other *Anatomiſts* have obſerv'd three other Hollowneſſes, though not in all Bodies: One of which is carry'd along the lower part of the *Scythe*, and is very narrow, & ends and opens into the fourth before-mention'd. The other two Lateral, leſſer and ſhorter, on each ſide one, in the hard Membrane diſtinguiſhing the Brain from the *Cerebel*, lie diſtant from the larger about a Thumbs breadth, into which ſometimes they empty themſelves, and ſometimes run out as far as *Hierophilus's Wine-preſs*.

Riolanus laughs at theſe leſſer Hollowneſſes; perhaps, becauſe he never ſaw them, or elſe, becauſe, according to his uſual Cuſtom, he takes it ill, that he was not the firſt Diſcoverer; and therefore would deprive the firſt Inventers of the Honour.

The Uſe of the Cavities.

VIII. *Into theſe Hollowneſſes, beſides the Branch of the hindermoſt* Carotis, *ſeveral little Arteries running through the* Meninx, *make their Terminations; the innumerable ſmall Orifices of which are manifeſtly conſpicuous in the uppermoſt larger Hollowneſs.* Which abundantly refutes *Fallopius*, who aſſerts, That there is no Artery which reaches theſe Hollowneſſes. Moreover, many Veins of the *Meninxes* open into the ſame, pouring forth Blood into them; which *Willis* and *Wepfer* have taught us by certain Experience: For when they ſpurted in any black Liquor with a Syringe into the Root of the *Carotid* Artery, they obſerv'd that black Liquor to paſs through innumerable Arterious & Veiny Branches, till it flow'd at length into thoſe Hollowneſſes, and out of them into the Jugular Veins.

Whether any ſmall Pipes in the Hollowneſſes.

Bauhinus *and* Veſlingius *alſo write, That certain little Pipes belonging to the Hollowneſſes, run out between the Veins and Arteries, into the Subſtance of the* Meninxes *and the Brain.* *Walæus* alſo obſerving the wider Orifices of certain ſmall Veſſels open into the Hollowneſſes, and that the ends of the ſmall Arteries could not poſſibly be ſo wide, believes that theſe ſmall Pipes meet by *Anaſtomoſis* with the Extremities of the Arteries diſperſed through the *Meninxes* and the Brain, and ſo receive from them the Blood remaining after nouriſhment of the Parts, and empty it into the Hollowneſſes. Which *Anaſtomoſis Highmore* figures out with egregious big Lines in his 18th. Table of his 3d. Book. But *Walæus* does not conſider, that the Orifices of the little Arteries gaping into the Hollowneſſes, are not wide, but very ſmall; and that the Veſſels which open into them with wider Orifices, are Veins; which running large and numerous through the *Meninx*, empty themſelves into the Hollowneſſes. So that there is no neceſſity to feign any ſmall Pipes produc'd from the Hollowneſſes; when our Eye-ſight plainly tells us, that thoſe Arteries and Veins reach with their Extremities, and open into the Hollowneſſes without the help of any ſmall Pipes.

Into theſe Hollowneſſes therefore, the Blood which remains after nouriſhment of the *Meninxes* and Brain, empties it ſelf through the Vein; and that which ſeeks to flow in greater quantity into thoſe parts, through the Arteries; and thither alſo flows the Blood redundant in the *Choroides* Fold, through the Vein, which ſometimes ſtreight, ſometimes forked, runs between the middle Fold, in the third Ventricle, above the Pine-Apple-Kernel, (which Vein *Galen* calls the Vein that riſes from no other Vein) and aſcends through the fourth Hollowneſs into the upper large Hollowneſs, and thence by and by into the two lateral Hollowneſſes, toward the *Maſtoides* Excreſcencies, or the *Baſis* of the hinder part of the Head, to return from thence into the innermoſt Branches of the Jugular Vein, immediately united and continuous to them, and ſo to the Heart: Now by means of that Blood being forc'd through the Orifices of the ſmall Arteries, into the Hollowneſſes, it comes to paſs that in the *Cranium* of a living Animal, there is obſerv'd to be a manifeſt Pulſation in the uppermoſt large Hollowneſs; which may be eaſily try'd in the Head of a Calf or Pig newly calv'd or farrow'd. But becauſe thoſe Hollowneſſes are very wide, hence the Blood which is pour'd into them, and forc'd forward by the pulſations of the ſmall Arteries, by and by flows to the lower parts; which is the reaſon that the uppermoſt larger Hollowneſs, together with the two lateral Hollowneſſes, are found for the moſt part empty, without any Blood, or containing very little, and very ſeldom full of Blood; which nevertheleſs we have frequently obſerv'd in People that were hang'd. Hence it appears how groſly *Lautenbergius* is miſtaken, who believes the Animal

mal Spirits to be generated in those Hollowneſſes; as alſo *Kyper*, who writes, That the Blood is ventilated and refrigerated in them, for the more commodious Uſes of the Brain, and more commodious Generation of Animal Spirits.

Tenuis Meninx.

X. *The other Membrane endu'd with an exquiſite Senſe of Feeling, and furniſh'd with ſeveral ſmall Arteries and Veins, is* λεπτὴ μήνιγξ, Tenuis Meninx *and* Pia Mater, *or the Thin Meninx and Holy Mother; ſo call'd, becauſe it is extream thin and ſlender, and like a tender and pious Mother, immediately and ſoftly enfolds the Brain and its Parts, and prevents them from ſpreading abroad, and alſo more profoundly involves and mantles its Cells and Turnings, and ſo renders the exterior Superficies of the Brain as it were plain and ſmooth.* Which upper Connexion being looſned, the Windings and Meanders, as being cloath'd with this *Meninx*, might be eaſily unfolded and ſeparated. From this thin *Meninx* proceeds alſo an extraordinary thin Membrane, inveſting the innermoſt Ventricles of the Brain.

The Folds of the Veſſels.

IX. *This Membrane is interwoven with wonderful and numerous Folds of ſmall Veſſels or little Nets, penetrating to the innermoſt of the Kernels of the Rind of the Brain, and riſing from the Carotid and Cervical Arteries, joyn'd together to and again with mutual Cloſures, to the end that for the better nouriſhment of the great Bowel the Brain, and the Confection of Animal Spirits, plenty of Blood might flow from all parts through theſe innumerable Conduits.*

Willis writes, that he has obſerv'd ſeveral little Kernels interſpac'd between theſe Folds of the Veſſels, which, he ſays, may be eaſily perceiv'd in a moiſter or Hydropic Brain, though hardly viſible in others. But without doubt, thoſe Glandules here obſerv'd by *Willis*, were ſome Kernels of the Rind it ſelf of the Brain, which ſwelling with ſerous Liquor, and riſing outward, ſeem'd to him to be peculiar Kernels interſpac'd between the Folds.

The Marrow or Pith of the Brain extended to the end of the Back-bone, and all the Nerves proceeding from it, receive a double Tunicle from theſe *Meninxes*, which being defended and preſerv'd, they run forward to the ſeveral Parts for which they are appointed.

CHAP. V.

Of the Brain.

The Brain.

I. *THE Coverings being taken off, we come to the Brain, in Latin*, CEREBRUM; *by the* Greeks *call'd* Ἐγκέφαλος, *which is the general Organ of Sence; by means whereof the Soul, which is the Princeſs and Governeſs of the Body, performs all the Functions of the inward and outward Senſes, and voluntary Motion.* For here ſhe ſits and judges of the Senſations of the ſenſitive Parts; and from hence, as from a Fountain, ſhe communicates to all the ſenſitive Parts of the Body, the Rays of all her Benignity, the Animal Spirits begot in the Brain, through the Channels or Rivulets of the Nerves, and by them ſupplies to every one a Faculty to perform the Animal Actions.

Whether the Brain be a Bowel or a real Kernel?

II. Here in the firſt place, ſome there are who raiſe a Queſtion, *Whether the Brain be a Bowel or a Real Kernel? And whether to be reckon'd among the number of the Bowels?* *Hippocrates* ſeems to have reckon'd it among the Kernels: *For*, ſays he, *the Brain is bigger than the reſt of the Kernels*; as if he meant, that the Brain were the biggeſt Kernel. *Wharton* ſays, it is a difficult thing to allow it any proportion common to the reſt of the Bowels, and therefore excludes it out of the number. With *Wharton* alſo *Malpigius* ſeems to agree. Others, with *Plato*, have plac'd it among the Marrows, by reaſon of its Friability, its Softneſs, and its being ſurrounded with Bones; though it differ from the Marrow of the Bones; neither does it take fire as that does. But they are all under Miſtake, who number it among the Kernels or the Marrow; ſeeing that both the diverſity of the Subſtance and Structure plainly ſhew that it has no reſemblance either with the one or the other. But ſome will ſay that the whole

Cortex

Cortex or Rind is nothing but a heap of Kernels: But because any part contains several Kernels, although they make toward the necessary complement of the Part, it cannot be thence concluded that the Part is a Kernel, for then the Liver, Spleen and Kidneys, because they contain many Kernels interspac'd within their Substance, were to be call'd Kernels, and excluded out of the Society of Bowels. The Nose also, the Tongue, the Eye-lids, by reason of the Kernels allow'd 'em, and the Roof of the Mouth were to be call'd Kernels. Besides the Dignity of the Brain it self, and the Nobleness of the principal Operations which it performs, clearly demonstrate, that it is really a Bowel, no less than the Heart, Liver, *&c.* and performs its own and those the principal Actions, and generates the most noble Spirits of the whole Body, that is to say, the Animal; and therefore most deservedly call'd a Bowel by *Galen*, and also by *Aristotle*.

The formation of it.

III. *The Brain is form'd out of the Blossom of the Seed, at the same time with the rest of the Parts.* And therefore those Fictions are to be rejected, which *Ludovicus de la Forge*, following *Carnesius*, has feign'd, That the Brain is form'd out of the thicker Particles passing through the Pores of the Arteries, & thence by reason of the narrowness of the Pores extending themselves into long Threds, and so making the substance of the Brain, as it were compos'd of Strings; and through the force of the Spirits bursting forth out of the *Pineal* Artery and the Arteries adjoyning, hollowing the inside of it by accident with various Cavities or Ventricles: A Fiction easily refuted; for the Brain is not form'd out of the thicker or harder Particles of the Seed passing through the Pores of the Arteries; for besides that the Seed does not flow through the Arteries, there are no Arteries that appear before the Brain in the first formation; but all the parts are delineated and form'd together out of the Blossom of the Seed, and not one after another, or by another. Nor could the Ventricles of it be hollow'd by any violence of the Spirits breaking out of the *Pineal* Artery or Arteries adjoyning, seeing there could be no such Violence in the first Formation. Nor could that Violence be caus'd by an Instrument (the Brain) not yet perfectly form'd; (for such *de la Forge* supposes it to be at the beginning) whereas the *Pineal* Kernel it self shews the contrary, that the Brain was form'd before that or any other Violence could be; for seeing that Kernel could be in no other place, but either in the third or middle Ventricle, of necessity that place could not be made by the Thing plac'd, or after the Thing plac'd, but either together with the Thing plac'd, or before it.

The Division of the Name.

IV. *Sometimes the Brain in a strict signification, is taken for that greater Part which is properly call'd the Brain; and is distinguish'd from the Cerebel and Marrow.*

The Bigness.

V. *The Bigness of the Brain of Man, according to the Proportion of the whole Body, is bigger than the Brain of any other Creature; as being that which exceeds the Brain of an Elephant in quantity; and the Brain of an Ox double the weight, for it weighs four or five pounds.* Tho' *Lynden* affirms, That according to the Proportion of the Body, a Sparrow's Brain exceeds that of a Man. *Fernelius*, *Vesalingius*, *Riolanus*, *Bartholine*, *Highmore* and *Lindan*, following *Fallopius*, tell us, that according to the Wane or Increase of the Moon, the Brain of man diminishes or increases. But no certain Alteration of the Animal Actions ever made out any such change in this most Noble Bowel. Nor can this Opinion ground it self upon any Experience; because that the Brain of one and the same Animal can never be inspected and weigh'd at the two different Seasons of the Moon: And from different Inspections at different Seasons of the Moon, nothing of Certainty can be gather'd; for the Quantity of the Brain, though in Animals of the same kind, is not always alike; for that the Brain-pans of some are bigger, in some less; so that the quantity of the Brain, less or more, is not to be attributed to the Moon or her Seasons; but to the form and bigness of the Part containing. In *April* and *May* 1661. I attended the Cure of a Sayler dangerously wounded with a Stone in the right Bone of the fore-part of the Head, with a Fracture and Depression of the *Cranium*; we took out the broken Bones about the breadth of a large Doller; Afterwards, the *Dura Mater*, very much endamag'd by the Contusion, being separated of its own accord, was taken out to the same breadth, the thin *Meninx* remaining untouch'd. The Brain

Brain in that place remain'd depreſs'd about the breadth of half a Finger; and for two Months together that the Cure laſted, we could not obſerve the leaſt decreaſe or increaſe of the Brain, notwithſtanding all our diligent obſervation upon all the Changes of the Moon. At length, the Fleſh growing largely out of the thin *Meninx* (which was never ſeen, read, or hard of before) and contrary to all expectation, ſupplying the place of the hard *Meninx*, and cloſing with the Fleſh riſing from the *Diploïs*, the deſpairing Patient, who had already agreed with *Charon* for his Paſſage, recover'd and was cur'd.

Whether immoderate Venery diminiſhes the Brain?

VI. *As equally uncertain it is what* Horſtius *writes, That he ſaw the Subſtance of the Brain diminiſh'd by immoderate Uſe of Venery.* For how could he know whether the Perſon he ſpake of, had any more Brain before? Did he ſee and weigh it? Immoderate Venery weakens the Brain, 'tis true; but whether it diminiſhes it or no, there's no man can certainly tell.

Whether Men or Women have moſt Brains?

VII. *As frivolous alſo is that which ſome deliver upon* Ariſtotle's *Reputation, That the Brain of a Man exceeds a Woman's in quantity.* For moſt certain it is, there can be no remarkable difference diſcern'd: For as Men have more or leſs Brains according to the Capaciouſneſs of the Skull, ſo it is with Women. If a Man compare a Man's greater Head with a Woman's leſſer, no wonder if he find more Brains in the Man's than the Woman's Head; but alter the Compariſon, and he ſhall find more in the Woman's Head than in the Man's; but to find two Heads exactly proportionable in both Sexes, and ſo to judge exactly of the Quantity, is impoſſible.

The Shape.

VIII. *The Shape of the Brain is ſomewhat round, bunching out toward the Forehead; the external Superficies full of Windings and Meanders, and twining like the Guts, which Windings being cloath'd with a thin* Meninx, *furniſh'd with ſeveral little Caps of Arteries and Branches of Veins, deſcend very deep, and ſome almoſt equal the depth of the Brawny Body; but above are all collected and bound together by the ſame* Meninx. In Coneys and other ſmall four-footed Beaſts, the Superficies of the Brain is not ſo full of Windings, but is more ſmooth; ſo that the Windings hardly deſcend at all. But in moſt Birds, the external Superficies of the Brain appear almoſt altogether equal, without any Meander-like Turnings.

The Subſtance.

IX. *The Brain conſiſts of a peculiar Subſtance, white, moiſt, ſoft, melting like Fat, rather than flowing, though it be not Fat.*

The Colour and Softneſs.

X. *The Colour and Softneſs of the Subſtance is not all alike*; for in the outward part, ſo far as the crooked Paſſages deſcend among the Windings and Turnings, the Softneſs is more, and the Colour more reſembling Aſhes; but in all the reſt of the inner part altogether white, and the Subſtance more ſolid.

The Fibers

XI. Des Cartes *by many probable Conjectures maintains, That this Subſtance muſt be altogether Fibrous, as being compos'd of Thouſands of little Strings*; which Strings *Willis* calls little Channels or Plaights. And what *Des Cartes* perceiv'd with the Eyes of his Mind, *Malpigius* demonſtrates by Ocular Inſpection; for he writes, That by the help of his Microſcope; he has often obſerv'd in the Brain of an Ox and other Cattel as well raw as boild, that all the white Portion of the Brain ſeem'd to be divided into little Fibers flatly round, which were ſo manifeſtly conſpicuous in the Brains of Fiſh, that if they were held againſt the Light, they repreſented an Ivory Comb, or a Church-Organ. The Extremities of theſe Fibers, he ſays are thruſt into the *Cortex*, or outward Aſh-colour'd part of the Brain, as if they were to take their Alimentary Matter from thence; into which *Cortex* a vaſt number of Blood-bearing Veſſels branch themſelves. Laſtly, He adds, That 'tis probable that the Sanguineous Juice, or ſomething like it, being carry'd from the Arteries, is, as it were, filter'd by this Fleſh of the *Cortex*, and graſted into the Fibers, as into Roots. Which he endeavors to prove by this Experiment: For, ſays he, when the Order of Nature is at any time interrupted by any Sickneſs or ſickly Habit, we may often obſerve a copious Collection of this *Serum*, being out of its Road, in the Ventricles, the Subſtance of the Brain, and under the *Meninxes*. And to prove this, he brings ſeveral Stories of ſick People, who have had a great quantity of ſuch *Serum* gather'd toge-

ther in the Head. *Tracaſſatus* alſo writes, That he has obſerv'd the ſame things in the Head of a Dog, and ſhews the manner of diſcovering it. He alſo affirms the Brain and Marrow to be a great Spunge, conſiſting of Threds twiſted every and all manner of ways one within another. Moreover, he is of opinion with *Malpigius*, that the whitiſh Marrowy Subſtance borrows ſomething from the ſaid *Cortex*, as into which the Marrowy Fibers are inſerted, and therefore ſeem to take ſomething from thence. Very probable it is, that the thinneſt ſalt Particles of the Blood are ſeparated from the reſt in that Glandulous Subſtance, and ſo prepar'd, as to be receiv'd by the ſmall Fibers, as inviſible Pipes, to be there converted into Animal Spirits. *Tracaſſatus* calls thoſe thin Particles, which I call ſalt, *Concreſcibile Serum* and *Nerveous Juice*; which he ſays is ſeparated in the *Cortex*, and ſo infus'd into the Fibers.

The Cortex, and Pith, or Marrow.

XII. Picolhomini *calls the outward Aſh-colour'd Subſtance, the Brain, and the inner whitiſh Subſtance, the Marrow; and ſo diſtinguiſhes the whole Subſtance into the Rind and the Marrow; and* Bauhine *and* Bartholine *ſeem to do the like.*

That ſame Aſh-colour'd Subſtance, Rind or Shell, is not only ſpred about the outſide of the Brain, and deſcends into its Windings and Meanders, but appears alſo in ſome places in the inner whitiſh Subſtance, and ſomewhat encompaſſes the Spinal Marrow, and by the obſervation of *Malpigius*, enters a little way into the inner parts of it.

How the Matter of the Animal Spirit is ſeparated from the Brain.

XIII. *Now though from what has been ſaid, a great Light is given for the deeper knowledge of the Brain, yet there is one thing yet wanting to be diſcuſs'd, that is to ſay, how the ſalt, ſpirituous Matter is ſeparated from the Blood, to be turn'd into Animal Spirits.* We have already ſaid that the Choleric Particles are ſeparated from the Blood in the Liver, by means of the glandulous Berries; ſo the ſubacid in the Spleen, and the ſerous Particles in the Kidneys. Which Office is here alſo performed by certain ſmall Kernels, hardly viſible to the Eyes of Anatomiſts; for the diſcovery of which Kernels, we are beholding to the quick-ſighted *Malpigius*, who by his Microſcopes diſcover'd that the whole Aſh-colour'd Rind was a heap of ſmall Kernels of an oval figure, and form'd out of that heap. Which ſaid Kernels being diſpos'd in Wrinkles and Kernels, compos'd the outward Meanders of the Brain, and that into the outward portion of thoſe Kernels the Blood-bearing Veſſels enter'd that paſs'd through the *Meninx*; but that from the inner white portion there ſprung out a white Fiber, as a proper Veſſel, and ſo to each Fiber there belong'd a little Kernel, that whereſoever the Meanders were croſs'd, a ſolid and determinate Heap of Kernels might be pour'd upon the Marrow; and ſo he obſerv'd, that the Marrowy Subſtance of the Brain was compos'd of a Contexture and Bundle of many ſmall Fibers. He adds the Opinion of *Fracaſſatus*, That the Glandulous Rind ariſes from the Concreſcible *Serum*, and the Marrowy Fibrous Subſtance, from the purer Salts that light in thoſe places. Laſtly, He adds the way how to find out thoſe Kernels of the *Cortex*. He ſays, they are hardly to be diſcern'd in the raw Head, though of a large Animal, becauſe they are torn by rending off the *Pia Mater*; and the intervening Spaces, by reaſon of the Softneſs, are not ſo eaſily diſtinguiſh'd; but they appear more conſpicuous in a boyl'd Head: For their Subſtance growing thick in the boyling, renders the ſpaces between more open; which upon taking off the *Pia Mater*, become more apparent; eſpecially when the Head is warm, and then being ſprinkl'd with Ink, and that ſuck'd up again with a little Cotton, they become conſpicuous; for the Spaces between being blacken'd by the Ink, more eaſily ſhew the Kernels that lie round. In the ſame manner, he ſays, the ſaid Kernels may be diſcern'd in the Heads of Fiſh and Fowl. Certainly we are highly beholding to *Malpigius* for this Diſcovery; whereby we may be the more able to judge of the Conſtitution, Office and Manner of the Brains acting.

whether the Shell be ſeparable from the Marrow?

XIV. *From this Obſervation of* Malpigius, *now manifeſtly appears the great Miſtake of* Picolhomini, *who alledges, that in a Body newly deceas'd, the Marrow is to be diſtinguiſh'd from the* Cortex *or Shell, with certain Lines, and may be exactly ſeparated from it.* Which *Bauhinus* after him, averr'd; and *Bartholine* tranſcrib'd out of him; whereas there is no

Line

Line between the white Marrow of the Brain and the Shell, nor are those parts to be disjoyn'd; but the Medullary Fibers enter the Kernels of the Shell, and are so fasten'd to them, that they can be no way separated one from the other without manifest prejudice.

The Temper of the Brain.

XV. *The Substance of the Brain, because compacted out of several Particles of melted Salt, and few of Sulphur, being compar'd with the rest of the Bowels, is moister and less hot; and therefore its Temperament is concluded to be cold and moist*; though it have less Heat, yet such a Heat as is manifest enough; for that being every where sprinkl'd with Arterious blood, it cannot but from thence partake of heat.

Its Arteries.

XVI. *It receives Blood, for the nourishment and making of the Animal Spirits, through the Arteries which are drawn from the* Carotides *and Arteries of the Neck*: Of which, the latter being divided into several small Branches, pour store of Blood into the Substance of the Cerebel, the other into the Substance of the Brain it self both above and below; which passes not only through those invisible Branches, but also, like Dew, through the Pores of it; of which, innumerable small Drops, upon dissection of the Substance, appear starting out of its small Vessels and Pores. As to these Arteries, *Franciscus de le Boe Sylvius* observes, that while they penetrate the thick *Meninx*, they leave the other Tunicle, and are scatter'd together with the thin *Meninx*, through all the Windings and Turnings of the Brain, accompany'd with very few Veins. *Thomas Willis* moreover, prosecuting their winding Ingress more diligently, writes, that being to enter on both sides the proper Channel, hollow'd in the Wedg-like Bone, for their better Defence, they assume an additional Tunicle; which after they have passed the Wedg-like Bone, and coming to stay within the *Cranium*, they again leave off, and then near the sides of the *Turkish Saddle*, with a winding Channel they creep forward till they come to the Head of the *Turkish Saddle*; where again fetching another winding Compass, they ascend directly, and penetrating the Hard Mother, they are carry'd toward the Brain, before their entrance, sending forth several little Branches woven artificially and wonderfully together, forming a kind of Net in most four-footed Beasts, to stop the too impetuous influx of Blood through those innumerable Windings and Turnings, which influx, because in Man that carries his Head upright, it cannot be so impetuous, therefore in Man this wonderful Net is but small, and but little conspicuous.

Whether the Arteries enter the Substance of the Brain.

XVII. *That the Blood is carry'd to the Brain through these Arteries, is without doubt; but the manner how it is done, is much controverted by Anatomists.* For some believe, that the little Arteries do enter the Substance of the Brain: Others, that they do not enter the Substance; but only pour the Blood into its Pores. The first Opinion is maintain'd by *Fallopius*, *Bauhinus*, *Spigelius*, *Highmore*, and several others, and among the rest of late, by *Willis* and *Wepfer*; and they endeavour to prove it, partly from the little Drops of Blood which spout out of the dissected Substance of the Brain; partly from the swelling of the Carotid Artery, upon the putting in of a little Pipe, and blowing into it; by which means, the Blood being forc'd inward, dies the dissected Substance with innumerable little red Spots; or else by the injection of Ink into the Substance of the *Carotides*, by which means innumerable black Spots appear in the Substance it self of the Brain. The Patrons of the latter Opinion, prove that the Blood is pour'd into the Pores only of the Substance of the Brain, and so is distributed through the whole Substance by the motion of the Brain; because that never any Arteries could be seen or discern'd by the Eye in the Substance of the Brain; besides, that by reason of the softness of the Part, the Arteries would be compress'd and clos'd up for the most part. Which *Aristotle* also asserts, when he writes, That the Substance of the Brain contains neither Vein nor any Blood-bearing Vessel within it self; and besides, that it is not so firm, that Arteries and Veins should be dispers'd through it, as in other Parts of the Body. But this difference may be easily reconcil'd upon the joyning of these two Opinions together, and asserting, that the Blood partly enters the brain together with the little Arteries, and that partly being pour'd into the Pores, it moves forward through the Substance of the Brain, in the same manner as the blood in the Liver is thrust forward through the

Veins, and in the circulation of the blood, paſſes through the Subſtance of the Parts. For if the ſubtle Arteries ſhould not penetrate the Subſtance of the brain, a ſufficient ſupply of blood could not be pour'd into it; and again, if the blood ſhould not paſs through the Pores of the Subſtance, but that the innumerable little Spots of blood, which are to be ſeen in the Diſſection of the Subſtance, ſhould flow out of the ſmall Veſſel being wounded, certainly Myriads of ſmall Veſſels muſt be contain'd in the Subſtance; nay, the whole Subſtance would ſeem to be woven and compacted together out of that ſort of ſmall Veſſels, which however ſeems leſs probable.

The Veins. XVIII. *The remainder of the Blood which is infus'd through the ſaid Arteries into the Brain, and there concocted, is empty'd into the Veins and Hollowneſſes of the* Meninxes, *to be carry'd to the Branches of the Jugular Veins, and thence to the Heart.*

The Anaſtomoſes of the Veſſels. XIX. *As to theſe Blood bearing Veſſels, together with the Arterious and Veiny Veſſels*, Willis *has obſerv'd, that while they aſcend upwards to the Brain, they are various, and in ſeveral places cloſe & meet together about the thick and thin* Meninx; *not only Arteries with Veins, but Arteries with Arteries; that is to ſay, the* Carotides *of the one ſide, with the* Carotides *of the other: moreover the Vertebrals of both ſides one with another; as alſo with the hinder Branches of the* Carotides, *and that the mutual Cloſures of the* Carotides *are about the Baſis of the Skull under the hard* Meninx *and between it.* To the knowledge of which Cloſures, and as it were mutual Kiſſings of each other, he attain'd by this Experiment. *As often*, ſays he, *as I injected any Liquor dy'd with Ink into either of the* Carotides, *preſently the Branches of each ſide, and the chief Diſſeminations of the Vertebral Arteries, were colour'd with the ſame Tincture: Moreover, if the ſame injection were repeated ſeveral times through the ſame Paſſage, the Veſſels creeping through every Angle and Corner of the Brain and Cerebel, will be dy'd with the ſame Colour. And in thoſe Parts which are overſpread with that miraculous Net, the Tincture injected of one ſide, will penetrate the Net-reſembling Folds in both ſides: Whence it is apparent that there is a Communication between all the Veſſels that water the whole Brain.*

At length he adds, That ſeveral ſmall Kernels are interſpac'd between the diminutive Nets of the Veſſels kiſſing each other, eaſily diſcern'd in a moiſt and hydropic brain, though in others hardly to be diſcern'd.

Its Nerves. XX. *The Brain has no Nerves in its own Subſtance*; for in regard the Organ of Feeling is general, and judges of all the Senſes and Animal Motions, it ought to be void of Sence and Animal Motion; for being endu'd with one Sence or Motion, it could not have rightly judg'd of others, becauſe the ſeveral Sences are mov'd but by one object only; as the Sight by the viſible object; and Feeling by the object of Feeling, *&c.* If therefore the brain were endu'd with any one Sence or Motion, the Soul could not by means of that organ make a true Judgment of any Sence or Motion; and therefore being fram'd void of Sence and Animal Motion, it is neither in its own Subſtance endu'd with any Nerves, though it contain ſome certain Fibers, but ſo ſmall, as hardly to be diſcern'd without the help of a Microſcope, and which are the originals of the Nerves, and be form'd and compos'd of them, being woven together, and from their oblong Marrow give birth to all the Nerves. Hence alſo *Galen* ſays, *That the Brain was made not to feel; but to confer the Faculty of Feeling*: For which Reaſon he calls it *the Organ that has no Feeling.*

Its Diviſion. XXI. *The Brain properly taken, is divided into the Right and Left Region; the Scythe-like Duplicature of the hard* Meninx *going between: which Diviſion extends it ſelf however no farther than the Brawny Body. But being taken for the whole Bowel which is included in the* Cranium, *it is divided into the Brain and little Brain, as being ſeparated for the greater part, by the interceſſion of the hard* Meninx.

Its Motion. XXII. *That the Brain is mov'd, is a thing not to be queſtion'd, as being obvious to Inſpection.* But concerning this Motion, there are great Diſputes among Anatomiſts, Whether it be mov'd by its own proper Motion, not Animal, but Natural; or elſe, whether

ther by another Mover? *Laurentius*, *Picolhomini* and *Bauhinus* maintain the first, and endeavour to confirm it by several specious Reasons. Of the latter Opinion, are *Fallopius*, *Vesalius* and others; with whom we likewise concur: For the Brain is immoveable of it self; but is continually mov'd by another by Accident, that is to say, the Heart, and that not by any Animal Motion, but by the Natural Motion of *Systole* and *Diastole*; and follows exactly the Motion of the Arteries. For the boyling Arterious Blood being forc'd out of the Heart through the Arteries into its Substance, it is presently dilated; and when the same Blood is once cool'd in its Substance, it falls again. This Motion is apparent in Wounds of the Head; where I have observ'd it several times, at what time the Substance of the Brain after taking away the Bones and *Meninxes*, is easily conspicuous. For then, as the Pulse in the Wrist is to be perceiv'd quick or slow; after the same manner was the Motion of the Brain to be discern'd, and its Motion upon the failing of the Pulse in the Wrist in a Fit, ceas'd at the same time, as also did the Animal Motion of all the Parts; and when the Patient came to himself, with the Motion of the Pulses the Motion also of the Brain returns, and answered altogether to the Motion of the Heart. Which is a certain Sign that the Brain is not mov'd by its self, but accidentally by the Heart, and that its Animal Spirits flow into the Marrow and Nerves, meerly by the impulse of the Heart. Moreover, if the Brain were mov'd by the Animal Spirits flowing into the Heart out of the Brain, then the Motion of the Brain must precede and cause that Motion, but if the Motion of the Heart precedes that Motion of the Brain, then it cannot be that the first Motion of the Heart should be produc'd by the Animal Spirits flowing in after the first Motion of the Heart. Lastly, That the Head cannot be movable of it self, Reason it self teaches us, seeing that to the Work of Dilatation and Contraction, are requir'd Muscles, or at least Fibers so strong, as to contract themselves; both which it wants; and thus it appears that the Brain is not mov'd of it self, but by the Motion of the Heart.

But here arises another Question; Whether this Motion of the Heart happen at the same time and instant, with an equal Motion? *Columbus* believes, that the Motion of the Brain keeps exact time with the Motion of the Heart; and that both Parts swell and fall exactly together. Which if *Columbus* had said concerning the Motion of the Brain and Arteries, then he had spoken true; but as to the Motion of the Heart, it cannot be true: For when the Heart is contracted and falls, then by reason of the Blood impetuously forc'd into them, the Arteries swell, and as they swell, the Brain is dilated; therefore it is dilated at the same moment with the Arteries when the Heart falls, and falls when the Heart is dilated. Hence *Riolanus* more truly judges, that the Motion of the Brain is contrary to the motion of the Heart, so that when the Brain is compress'd by *Systole*, the Heart is elevated by *Diastole*.

Whether the Brain move by its own proper motion?

XXIII. *Hence it is evident how strangely* Fernelius *was out of the way, who consenting with* Galen, *avers, that the Body of the Brain is mov'd of it self, and of its own accord, with a constant agitation.* Of the same opinion are also *Vesalius*, *Fallopius*, *Bauhinus*, *Riolanus*, *Sennertus*, *Plempius* and others. But *Andreas Laurentius* observes a Mean between both these Opinions; for he says, the Heart is mov'd partly of its own motion, and partly by the motion of the Arteries. *Highmore* will not allow the Brain any Motion at all, either accidental or proper; and asserts, that that same Motion which is seen and felt upon taking off the *Cranium*, is a Motion of the Membranes, happening by accident; by reason of the Arteries inserted into them; For proof of which, he alledges, that the Spinal Marrow is immovable, and has no Pulse at all. But had he seen so many Wounds of the Brain, after taking away part of the Substance it self, as *Plempius*, *Hildan* and my self have done, and observ'd the Motion of the Brain laid bare, he would readily subscribe to my opinion. For the immobility of the Marrow extended in length, proves nothing, in regard the Brain may beat or be mov'd, and the Spirits thrust forward out of it into the Marrow, though the Marrow be not manifestly mov'd; perhaps as one Wave pushes forward another, so the Spirits are push'd forward through that into the Nerves. As we find the like to happen in the Veins through which the Blood is mov'd and passes without their Pulsation; whereas it flows into them through the Pulsation of the Arteries; and the Pulsation of the Arte-

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ries ceasing, it ceases to be mov'd; which is many times observ'd in letting blood in the Arm, when the Ligature binds the Arteries too hard, or that the Patient falls into a Fit; for the Pulse of the Arteries of the Arm ceasing, nothing of blood will flow out at the Incision made in the Vein; but upon untying the Ligature, or upon the Patient's coming to himself again, and the Arteries consequently beating again, the blood flows forth again. And in this manner the Spirits may be mov'd out of the Brain through the Marrow without any manifest Motion of the Marrow. Besides, who knows but that the Marrow may be mov'd after the same manner as the brain? That this may be certainly known, first, the Skull of a living Creature is to be open'd, then the Vertebers must be laid open, and the long extended Marrow to be laid bare, that a Judgment may be made upon the inspection both of the Marrow and the Brain; but before any true observation could be made, the Creature would die, and the inspection of a dead Carcass would signifie little: And therefore *Plempius*, upon probable Grounds believes, that the Marrow or Pith is likewise mov'd, because it is a kind of production from the brain, which therefore should be mov'd with the brain, to the end that the Animal Spirits being admitted by Dilatation, may press them out again by its Contraction.

The necessity of the said Motion.

XXIV. *The necessity of the said Motion, though accidental, is chiefly necessary, that while it is dilated, it may receive the Arterious Blood out of the Arteries, and by its falling again, may be able to force the Animal Spirits made out of that Blood toward the Nerves, and the remainder of the Blood to the Hollownesses and Veins of the* Meninx; *neither of which Actions can be perform'd without that Motion.*

What Organ it is.

XXV. *The Brain then,* as hath been said, *is the Organ wherein, and by the help of which, the Animal Faculties, by the assistance of the Animal Spirits generated therein, are made.*

The Seat of the Animal Faculties.

XXVI. *But in regard the Animal Faculties both feel, desire and move,* there is a Question arises, *In what part of the Brain they every one inhabit?*

Fernelius believes, that the feeling Faculty resides in the *Meninxes* of the Brain, because they feel and are not mov'd. That the moving Faculty is seated in the Marrow of the brain, because that is mov'd, yet has no feeling: Which opinion *Plempius* refutes, and rightly informs us, that both Faculties are generated and dwell in the Substance it self of the brain, and are thence communicated to the rest of the Parts.

Then again, as to the principal Faculties, the Imagination and Memory, the Controversie runs high, whether they are in the whole Substance of the brain? whether all in one part of it, or all distinct in distinct places? *Ætius* and some others that follow the *Arabians*, affirm, that they abide in distinct Seats, and allow to the Fancy the fore-part, to the Reason the middlemost, and to the Memory the hindmost part of the Head; induc'd by these Reasons.

1. Because it rarely happens, that one Faculty being deprav'd, the other remains sound.

2. Because the fore-part of the Head receiving a Wound, the Phansie is disturb'd and impair'd; and the hinder part of the Head being hurt, proves detrimental to the Memory. Others affirm these Actions to be exercis'd in the whole brain, and only differ in the manner of their operation, and that the brain is variously employ'd about them. Which opinion *Sennertus* and *Plempius* uphold by strong Reasons. But *Ludovicus Mercatus* seems to unite both these opinions together; For, says he, though all the Faculties are in the brain, however we must believe that one Faculty is more predominant in this or that Cavity than another, as the Spirits are more thin, more perfect, and more elaborate in this Cavity, and the Temperature more proper for this or that operation.

But Experience acknowledges all these opinions to be very uncertain, and that nothing can be positively determin'd either as to the Place where, or the Manner how these operations are perform'd. For there are many Examples produc'd by *Massa*, *Carpus*, *Fallopius*, *Arcæus*, *Augenius*, *Andreas à Croce*, *Peter de Marchetois* and others, of Patients, who having been wounded in their Heads, have had considerable portions of their brains which have either dropt or been taken out, while the principal Faculties have remain'd safe and sound; which seems not very possible,

ſible, if theſe operations are perform'd in the whole Brain, or any part of it, ſeeing that the operating Organ being grievouſly wounded, and ſome part of it taken away, ſurely thoſe moſt Noble Actions muſt be very much impair'd. I produce an Example a little lower of a certain young Perſon, who had a large Impoſtume that grew in his Brain, and penetrated to the upper Ventricles, who nevertheleſs liv'd for 7 weeks together in perfect ſoundneſs of his Senſes. Another remarkable Example I met with *Jan.* 1670. in a young Girl, upon whoſe Head by Misfortune had fallen a Stone that weigh'd near thirty Pound weight, and broke all the right ſide of her Head with a Fracture of the Skull and Forehead about the Coronal Suture, and the Brain wounded and much endamaged withal. Which Brain, two days after the taking out of fourteen pieces of broken Bones without any covering of the *Meninxes*, began to ſhoot upward from the broad Wound, and that by degrees to ſuch a height, that it came out without the Skull, firſt as big as a Pigeon's, next, as big as a Hen's, and laſtly, as big as a Gooſe Egg; which protuberant part being cut away with a filthy Stench, another like it ſhot up again, and ſo ſeveral putrify'd parts fell off of themſelves, ſo that during the Cure, the quantity of the putrid Brain that was ſeparated from the reſt, amounted to the bigneſs of a Man's Fiſt, in which condition the Patient liv'd ſix and thirty days with a perfect ſoundneſs of Mind and Memory, and all the Animal Actions performing their Duties, though ſhe were in that time taken with three Convulſion Fits and a Hickup. After ſhe was dead, the Skull being taken off, we found a large hollowneſs in the right ſide of her Brain, by reaſon of the waſte of ſo much of her putrify'd Brain, which extended it ſelf all along the upper Ventricle of the ſame ſide, and ſideways paſſing the third or middle Ventricle as far as the *Sphænoides* Bone. This memorable Accident ſhews us how uncertain all things are which are conjectur'd concerning the Seats of the Faculties, either diſtinct, or aſcrib'd to the whole Brain, ſeeing that in this Maid all the operations of Life and Intellectuals remain'd in their full force, and no way impeded by that putrefaction of the Brain which was empty'd out of her Skull.

But this may ſeem little, if compar'd with what *Theodore Kerckringius* relates of a total deficiency of the Brain; for he writes that he diſſected a Boy that had lain five Months and a half ſick of a Dropſie in his Head, in whoſe Skull he found no Brain, but only a little ſlimy Water, which was a thing never before, as he ſays, taken notice of by any Anatomiſt: Though many years before him *Zacutus Luſitanus* tells us of a Lad that was cur'd of a Wound in his Head, and three years after dy'd of a Dropſie in his Head; which being open'd, there was nothing to be found but only a pure Water, that was no way offenſive to the Smell, nor inſipid to the Taſte. Something like this *Coſterus* relates of a Boy born without a Brain, which Boy *Fontanus* and *Carpus* aſſure us, that they ſaw the 26th. of *Decemb.* 1629. Now in theſe Children where were the Animal Spirits made? Where was the Seat of the principal Faculties and the common Senſory? We muſt anſwer, that theſe Obſervations contain a manifeſt Error, not out of wilful Miſtake, but the more ſleight & careleſs inſpection, of *Kerckringius*, *Zacutus*, *Coſterus*, and the reſt. For *firſt*, the Brain might not have been altogether defective, as they thought, but only through the extraordinary redundance of the *Serum* was ſo ſoften'd that it ſeem'd to be a perfect Slime, which was the reaſon that few Animal Spirits were generated and that the operations of the principal Faculties were weakly perform'd, and ſo at length the Children dy'd. *Secondly*, *Kerckringius*, *Zacutus* and *Coſter*, through their over-haſty inſpection, might not obſerve whether there were not ſomething remaining of a more ſolid Brain by which the foreſaid operations might be perform'd. *Veſalius* in the Ventricles of the Brain of one that dy'd of the ſame Diſtemper, found nine pints of *Serum*, by which means the upper part of the Brain to the thickneſs of a Membrane, by means of its extenſion, was become very thin. However, all this while the Cerebel, and all the bottom of the Brain, as alſo the Productions of the Nerves were all in their natural condition. In like manner, in all the former Examples produc'd by *Kerckringius*, the upper part of the Brain might be extended, thin and ſoft; for which reaſon they examining no farther, too raſhly gave their Judgment, that the Brain was altogether wanting. Moreover, what *Kerckringius* adds, to confirm his Opinion from the Relation of an ignorant Butcher, of certain ſilly Sheep that had no Brains at all,

all, is a meer Fable, which *Kerckringius* ought not to have believ'd; becauſe no Creature of all thoſe that bring forth living Creatures, can live without a Brain, and the ſooner the Heart and Brain are form'd in ſuch Creatures at the beginning of the formation, the ſooner and the more all the other parts of the Body encreaſe; as alſo all the Actions as well Natural as Animal: So that theſe operations prove nothing of any operations perform'd without the aſſiſtance of the Brain. But as to the Seats of the Animal Functions, and after what manner they operate, there lies the main Queſtion undetermin'd.

And theſe Miſts a certain Obſervation in the Brain of an Ox ſtill renders more obſcure, which *Bauſchius* tranſcribes out of *James de Negroponte*; how that the *Benedictine* Monks having a Deſign to fat an Ox at *Padua*, put him up; but obſerving that the Ox did not grow fat, though he eat greedily, they kill'd him, with a reſolution to enquire into the Cauſe of his continu'd Leanneſs; to which purpoſe the Ox was cut up by *Sebaſtian Scarabeccio*, Anatomy Profeſſor at *Padua*; *When*, ſays he, *we came to the Brain, we found it altogether like a Stone; which all the ſtanders by wondring at, ſome thought it might have been congeal'd by ſome extremity of Cold: and therefore laying the Head in a Platter before the Fire, they powr'd hot Water upon it, and boyld it for ſome time; then taking it from the Fire again, they found the Brain harder than before, ſo that they could not get it out of the Skull.* Having told this Story, he propoſes two Doubts; If the Brain, ſays he, be the original of all the Animal Functions, of Motion and Sence, and this is ſuppos'd to be petrify'd, how was it capable of admitting any Faculty to impart Motion, Sence and Appetite to the Ox? Or ſince this Ox had an Appetite to eat, how came he not to grow fat? Not leſs miraculous was that Brain which was ſeen in a *Swediſh* Ox, deſcrib'd by *Bartholine*, which was wholly turn'd into a Stone, bor'd through with many holes; and now preſerv'd in a Farm belonging to the Count of *Oxenſtern*, where that Ox was kill'd. Truly ſuch obſervations more deeply conſider'd, command us to ſuſpend our Judgments in determining the Seats of the Animal Faculties, and their manner of operating, till other things more certain are diſcover'd, to render the truth of theſe things more evident.

The Pre-eminency of the Brain.

XXVII. *The Brain is the moſt Noble Bowel, which together with the Heart, rules and governs the whole Body, as its Actions plainly demonſtrate.* For it is the only Organ by which, and in which the Animal Spirits are made, without which, beſides that Life cannot ſubſiſt, no Animal Actions are perform'd which flow themſelves out of this Fountain. Whence it is manifeſt, that the Wounds which it receives muſt be very dangerous; for which reaſon *Hippocrates* truly pronounc'd all Wounds penetrating into its Ventricls to be mortal; nay, the leaſt Wounds which it receives, are to be accounted dangerous and mortal. For though monſtrous things, as *Averrhoes* calls them, have happen'd in the Cure of Wounds in the Brain, and ſome have with great difficulty eſcap'd, that have had a conſiderable portion of the *Meninxes* and the Subſtance of the Brain taken from them, yet a ſlight Wound of the *Meninxes* and Brain uſes to be the Death of the greateſt part, and it rarely happens that any one ſo wounded eſcapes.

Snakes taken out of the Brain.

XXVIII. By the way we are to take notice of what *Pliny* writes of Snakes that have bred in the putrify'd Brains of Men. Of which we have an Example cited by *Plutarch*, in the Life of *Cleomenes*, who was crucify'd by *Ptolomy*, about whoſe Head in a few days after, a huge Serpent twin'd her ſelf in folds; which the Doctors affirm'd to have bred out of the putrify'd Marrow of the Brain, and related it as wonderful to be admir'd at by all men. Thus *Rolfinch* tells us a Story from *Gerard* the Divine, of a certain Nobleman, whoſe Body being digg'd up again a Month after it had been buried, two great Serpents were found creeping out of the putrify'd Corners of his Eyes. Certainly Nature ſeems by this Generation of Serpents out of Human Carkaſſes, to ſhew the Author of all our Calamities, and of our ſwift Corruption.

CHAP.

CHAP. VI.

Of the Brawny Body; the light Enclosure, the three Ventricles, the Choroid Fold, the Fornix, the Buttocks, the Testicles, and the Pineal Kernel.

IN the Demonstration of the Parts of the Brain, some begin from the upper part of the Brain, some from the lower; the one following the Ancient, the others the Modern way of Dissection. For our parts, we shall first proceed according to the Ancient and most familiar way, and after that briefly according to the Modern way.

The Brawny Body. I. *The Brain being a little separated at the upper part, where it is divided by the interceding Scythe, more below, beneath the Division appears the* Brawny Body, *or* Corpus Calloſum; *call'd also* Psalloides: *Which Anatomists do commonly alledg to be a Portion of the Brain harder than the rest of the Substance.* Nor is it any peculiar Body added to the Brain, but only a Connexion of both sides of the Brain, or rather a Continuation of the Substance. In this Body *Willis* affirms, That he has observ'd certain oblique Plaits or Furrows which he describes in his Tables. These Strings or Fibers *Malpigius* has also observ'd by the help of his Microscope; and says, they are so apparent in the brains of Fish, that if they be held up against the Light, they resemble an Ivory Comb; and also that there may be seen bloody Vessels running between them.

The Lucid Septum. II. *The inferior part of the Brawny Body constitutes the Lucid Enclosure, or Looking-Glass, and the* Fornix, *next to which, on the upper side lie the two upper Ventricles.*

Veins. III. *Above, two remarkable Veins rest upon the Brawny Body, one of each side, which open into the fourth Hollowness.* Into these the Blood of most part of the small Vessels of the thin *Meninx* is empty'd, to be again conveigh'd through them into the said *Sinus* or Hollowness.

Franciscus de le boe Sylvius describes another Orifice observ'd by himself in the Lucid Enclosure. *The Brawny Body*, says he, *where it begins to grow thin, toward the Lucid Enclosure, we have observ'd, and there we found about a year since that the Enclosure it self has a narrow gaping sometimes divided into two parts, to our great Admiration.*

Ventricles. IV. *There are also several Cells to be observ'd in the Brain, closing together one with another.* For though the Cavities contain'd in this noble Bowel are continuous, nevertheless because at first sight, this Continuity seems carry'd on through narrower passages, hence the Anatomists divide those Cavities into four Ventricles or Hollownesses; of which three are seated in the Brain, the fourth is common to the Cerebel and the extended Marrow. But all on the inside are fac'd with a most thin Membrane, to which *Erastus*, not without reason, allows an obscure Sence of Feeling.

The two upper Ventricles. V. *The Brain being taken away as far as the Brawny Body, presently appear the two* Upper Ventricles, *vulgarly call'd the* Foremost, *by others, the* Lateral; *of which the one is the Right, and the other the Left.*

They resemble in some manner a Crescent Moon, and about the middle where they meet, they are distinguish'd one from the other with a white *Interstitium*, from the Substance it self of the Brain, and transparent being held to the Light; hence call'd the *Septum Lucidum*, and by others, the Looking-Glass. And this by the observation of *Malpigius*, is furnish'd with streight Fibers extended in length from the fore to the hinder Parts.

These Ventricles are alike both for Use and in Form; much larger and longer than the rest, overcast with a most thin Membrane, wherewith the inner parts of the other two are invested. At the upper part, from a beginning somewhat broad and obtuse, they grow somewhat narrow toward the third Ventricle, and of each side, with a Channel sufficiently wide, descend into the Papillary Processes, by which way they discharge the Flegm therein collected, through the Ethmoidean Bone into the Nostrils and Mouth. This Passage in the Brain of a Calf, will admit a Goose Quill; but in Men, is much narrower. These Passages the several Modern Anatomists never observ'd, and some have assum'd to themselves the Discovery thereof; yet are they at large describ'd by *Galen*, in his Treatise of the Use of the Parts.

At the hinder part which unfolds it

ſelf more circularly, and bends like a Scyth, they are carry'd downward to the bottom of the Brain, and end near the original of the Optic Nerves. In which place they are both enter'd by a Branch of the Carotid Artery, which forms the Choroid Fold.

The Fornix. VI. *At the lower and hinder part of theſe Ventricles, where they wind back to the former Parts, in the middle of the Brain underneath the Callous Body, and common to both Parts of the Brain, appear the* Fornix *or Arch, gibbous without, but hollow within, conſtituted by a moſt white marrowy Subſtance of the Brain, furniſh'd with arch'd Fibers toward the ſides, and overcaſt with a moſt thin Membrane.* It is alſo call'd *TESTUDO* or the Tortoiſe; for that like a vaulted Roof or an Arch in a Building, it ſeems to ſuſtain the burden and weight of the Brain reſting upon it. Of which more when we come to treat of the Optic Nerves.

From all the hindermoſt Thighs to the Arteries, in all the middlemoſt ſpace, it is not faſten'd to the Brain, but remains free. The hinder Thighs *Hippocrates* calls *Pedes Hippocampi*. *Riolanus*, guided by *Aranteus*, believes theſe Thighs to be Branches of the optic Nerves, turn'd upwards, and that the optic Spirits iſſue from thence as from a Fountain: hence, that they meet toward the fore-parts, to unite the viſible Species's within the Brain.

The Choroid Fold. VII. *In theſe two upper Ventricles, the Choroid Fold is to be met with, a wonderful and elegant Piece of Work, form'd out of a moſt thin and diminutive Membrane, produc'd from the* Pia Mater, *ſeveral ſmall Kernels, and ſmall Branches of little Veſſels variouſly complicated together.* Which little Branches come from the Twigs of the Carotid Artery, with which others think the ſmall Branches of the Cervical Artery to be intermix'd. With theſe ſmall Arteries twice or thrice we obſerv'd an apparent little Vein to run along all the whole Length of the Fold, and to pour forth its Blood into the third Ventricle into the Vein always in that place running through the middle of the Fold, and emptying it ſelf into the fourth Hollowneſs; and ſo to be continuous with it. *Bauhinus* and ſeveral others, contrary to all Reaſon and Sight, will have the Branch of the fourth Hollowneſs intermix'd. *Riolanus* aſſerts it to conſiſt of Veins only, without any Arteries; as on the other ſide, he believes the wonderful Net to conſiſt only of Arteries; though both the one and the other are for the moſt part conſtituted of Arteries, and have very few Veins, inſomuch that for that very reaſon ſome queſtion'd whether there were any Veins at all.

Its Riſe & Progreſs. VIII. *This Fold ariſes from the lowermoſt hinder part of theſe Ventricles, each of which parts a Branch of the Carotid Artery enters, which afterwards conſtitutes the wonderful Net, near the Spittle-Kernel, and wrapt about with a tender Membrane, aſcends upward into theſe Ventricles; where being divided into innumerable Branches, it forms this Fold expanded through the ſaid Ventricles.* Which when it has reacht the foremoſt Tuberoſities of the Ventricles on both ſides, round about the foremoſt Thigh of the Arch, or *Fornix*, paſſes into the third Ventricle latent underneath, to the ſides of which Ventricle it is every way faſtned, as alſo to the Subſtance of the *Fornix* it ſelf, reſting upon that Ventricle, with little Branches, which it ſends forth into the Marrowy Subſtance of the Brain. The Faſtning and Ingreſs of theſe little Branches is preſently ſeen, when the *Fornix* is lightly rais'd up and turn'd back, and ſo the third Ventricle is diſcover'd.

Its Uſe. IX. Through this Fold the Arterious Blood is conveigh'd for making of Animal Spirits, out of which thto' ſmall diminutive Kernels hardly conſpicuous and ſcatter'd among the little Arteries of the Fold, the more ſerous part, not fit for the making of Spirits, is ſeparated, ſuckt out and collected together in the Ventricles, not as an unprofitable Excrement, but as a uſeful Humor, and there to be prepar'd for a neceſſary Uſe, which is threefold.

1. By its Coolneſs, to temper the boyling Heat of the Blood paſſing along the Fold; for the Fold ſwims upon it; and ſo to prepare it for the making of Animal Spirits.

2. By flowing to the Glandules of the Tonſils and Mouth, to moiſten the *Larynx* and Gullet.

3. That in the Mouth, in which together with the Liquor flowing through the Spitly Channels, it begets the Spittle, and in the Stomach it may be mixt with the chew'd Nouriſhment, and help their Concoction by a peculiar Fermentation,

tation. In the same manner as the *Lympha* flowing to the Chyle-bearing Channels, prepares the *Chylus* after a specific manner, that so coming to the Heart, it may be the more easily dilated therein, and converted into Blood.

Slime or Snot.

X. *But when by reason of the coldness of the Brain, or some other Weakness, that Liquor is not sufficiently prepar'd, then becoming more crude and viscous, it is gather'd together in the Ventricle in greater abundance, and from thence not only flows more copiously to the Parts aforesaid; but many times the greater part of it, not able to fall down to the Jaws through the ordinary narrow Channels, a great quantity of it descends through other Passages to the Nose and Mouth, and thence as a superfluous Excrement, vulgarly call'd Flegm, or Snot, is evacuated at the Mouth and Nostrils.*

And that this is the true Use of the Pituitous Humor, many Reasons demonstrate.

1. For that in an extraordinary heat, the Head being very hot and dry, and consequently this Liquor being much wasted, and but little of it falling down to the Mouth and Tonsils, it causes a great drought of the Jaws and Mouth, and thence Thirst; which also happens for the same reason, in Fevers and other hot Distempers.

2. For that upon longing after any pleasing Food that a man sees, this Liquor, together with the Spitly Humor flowing through the Spittle-Vessels, flows no less from the Brain through the widened Passages, to the Mouth and Tongue, than the Animal Spirits, that are determin'd and sent by the Mind to the Parts that require Motion.

3. Because that in Persons of a hotter and drier Temper, in whom the serous and flegmatic part of the Blood does not so copiously abound, and the said Liquor is collected in a lesser quantity in the Ventricles, and is better concocted, and the thinner part much more dissipated, there are none or very few Excrements evacuated from the Nose and Palate, neither do they spit so much, but they are more thirsty.

4. Because that in moister Natures a great Quantity of this Liquor is collected in the Ventricles of the Brain, and hence a greater quantity of Spittle flows into the Kernels of the Jaws and Mouth, and the Spittle-channels, and frequently more crude to the Mouth and Stomach; nay, sometimes in so great a quantity as in a Day and a Night to fill whole Basons full, if the cold and moist Temper of the Brain send the Humor down in great Quantity; and sometimes descending in greater Quantity to the Stomach, it so relaxes and debilitates by its quantity, its Coldness and its Moisture, that it vitiates the fermentaceous Humors growing there; and by that means, takes away the Patient's Stomach, and hinders Concoction.

5. Because that for want of Spittle, the Act of Swallowing is render'd difficult, and the Concoction of the Stomach is ill perform'd; as is apparent in many that are troubl'd with Fevers.

The Progress of the superfluous Blood from the Fold.

XI. After this serous Humor being separated from the Arterious Blood of the Fold, and that a sufficient quantity of that Arterious Blood is transmitted into the Brain and Marrow, for the making of Animal Spirits, that Blood which remains over and above in the Fold, flows to the Vein, sometimes single, sometimes double in the Ventricle, running between the middle of the Fold, above the Pineal Kernel, and through that is carry'd to the great Hollowness of the Scythe. This Vein, *Galen* affirms to be deriv'd from no other Vein, because there is no Union or Conjunction of it with any other Vein to be observ'd. However *Bauhinus* believes it to be a Branch of the great Hollowness. Which Mistake is sufficiently refell'd by what we have said in the Fourth Chapter.

Rolfinch's Mistake concerning the Cause of a Catarrh.

XII. From what has been said, we are to take notice of the Grand Mistake of *Rolfinch*, who in a long Discourse seeking for a new Cause of Catarrhs, never before found out, and rejecting the Opinions of all others, tho' too inconsiderately, concludes, that the *Carotid* Arteries are the Fountains of all Catarrhs. For, he says, that they discharge their flegmatic Humors partly into the wonderful Net, and that from thence these Excrements ascend higher into the *Choroid* Fold and the Ventricles of the Brain, from whence they flow down to the Pituary Kernel, and there are insensibly wasted: Moreover, that the said flegmatic Humors are partly purged forth through the outermost Branch of the inner Propagation into all the spungy parts of the Nostrils, Mouth, Jaws and Palate, and are thence discharged as altogether unprofitable. Which they are faulty either in Quan-

tity, Quality, Manner, Time or Place of Excretion, then Catarrhs are thereby bred. But the Learned Gentleman did not consider how easily those flegmatic Humors stop up the narrow Passages of the slender Net and Fold, and what terrible Diseases thence arise, as, Apoplexies, Lethargies, *Carus's*, &c. to which men would be most frequently obnoxious, if that Proposition were true. Nor does he take notice that the Arteries equally convey the Blood to all Parts without any Choice; nor do they particularly convey the Choleric parts to the Liver, the Melancholy to the Spleen, or the Flegmatic to the Head, and discharge those Humors into those Bowels; which nevertheless he will have to be so done; whereas there is not in the Arteries any power of separating, any judgment to make choice; nor can those Bowels do it by any particular virtue of Attraction; but that the various alteration of one and the same Blood, and the separation of the smallest Particles is order'd according to the diversity of the Kernels, conformation and diversity of the parts into which it flows. He alledges many Arguments for the proof of his Opinion; but so contrary to Reason and Experience, that they are not worth a Refutation.

The third Ventricle. XIII. *Moreover, the Arch being turn'd backward, the* Third *or* Middle Ventricle, *which is the Concourse or Meeting of the two uppermost or foremost, as it were form'd in the Center of the Marrow of the Brain. Wherein are several things to be consider'd.*

1. Two Passages: The first of which with an eminent Process, which *Vestingius* calls the *Womb*, is carry'd downward to the Funnel, and pituitary Kernel, through which the Flegmatic Excrements of the Brain are vulgarly said to be evacuated, but erroneously. The other, which is call'd the *Arse*, or the hole of the Arse, passes to the fourth Ventricle, and is nothing else, than a hole form'd by the conjunction and closure of little fibrous Mountains, and two Buttocks and Testicles. This Channel being wrapt about with a slender Membrane, *Sylvius* calls by the name of *Alveus*.

2. Two remarkable little long Mountains, prominent upwards, consisting of a Substance compos'd of several little Strings or Fibers, and therefore call'd by some *Corpora striata*. These constitute the foremost upper part of the oblong Marrow conjoyn'd with the Brain and Pith (which is not observ'd by some, who think them to be parts of the Brain, and not the Marrow) but of a peculiar Substance, and as it were impos'd upon the Marrow, yet united and continuous with it, cloath'd with an extraordinary white Membrane, but fibrous within, less white, and more porous than the rest of the Marrow. This Part seems only to be serviceable to the Sight, as from whence the Optic Nerves proceed; whence *Galen* calls the said Monticles *Thalamos Nervorum Opticorum*, or the Nuptial Chambers of the Optic Nerves (where by *Thalami*, some think, though erroneously, that they are the two hinder Legs of the Arch;) and *Riolanus* reproves *Bauhinus*, for asserting, that all the Nerves within the *Cranium*, arise from the Spinal Marrow; whereas the Optic Nerves are wound about their own Chambers. By which Words, he plainly denotes, that these Monticles consist of a Substance altogether different from the rest of the Marrow, and that they are serviceable only to the Eyes. In the mean time, he does ill to reprove *Bauhinus*, for saying, that all the Nerves arose out of the Pith, in regard the Chambers of the Optic Nerves are the upper part of the Pith, and consequently the Optic Nerves proceed from the Pith, which *Riolanus* does not seem to have taken any notice of.

The Buttocks. XIV. 3. *Four Protuberancies, of which the uppermost, or foremost and largest, from their Resemblance, are call'd the Buttocks, or* Nates; between which and the fibrous Protuberances, there is a conspicuous Chink, by *Columbus* call'd the Womb, containing the hole of the Arse.

The Testicles. XV. *The lowermost and least, are call'd the* Testicles, *and are as it were two flat Prominencies growing and continuous underneath to the Buttocks.* But that same Difference between the bigness of the Buttocks and Testicles, is more remarkable in Brutes than in Men, in whom these four Protuberancies are seldom of an equal Magnitude.

Now these four Protuberancies, together with the Fibrous Protuberancies impos'd upon them, are the beginnings of the long Marrow, continuous below with

with the Brain; above and upon the ſides overſpread with a ſlender Membrane from the *Pia Mater*; having a Subſtance compacted of innumerable ſlender Fibers, as is ſeen by the Microſcope.

As to the Fibrous Protuberancies, this is to be obſerv'd, that though they be cover'd with an extraordinary white Membrane, yet they conſiſt of peculiar Subſtance within, ſtringy, fibrous, leſs white than the reſt of the Pith, ſo that they ſeem to conſtitute ſome peculiar part, as it were united to the long Pith, at the beginning in the uppermoſt part; and continuous with the Pith of the Brain. Now the Uſe of theſe two Protuberancies, is to be ſerviceable to the moſt noble Sence, which is Sight; becauſe that the Viſual Nerves only, and no other proceed from them.

The Pineal Kernel.

XVI. 4. *The Kernel ſeated between the Stones and the Arſe, near the Hole of the Arſe, which leads toward the Fourth Ventricle, call'd the Pineal Kernel, becauſe it ſomewhat reſembles a Pine-Apple, faſhion'd like a Top*: By others call'd the Yard of the Brain. This Kernel is but ſmall in Men; but much larger in Sheep and Calves.

It conſiſts of a Subſtance ſomewhat hard, which nevertheleſs ſuddenly flags, and being melted in ſtale Carkaſſes of Men, ſeldom appears. It is cover'd with a ſlender Membrane of a Aſh-colour.

It is oblong, looking upward, or rather forward with its Point, but with its bottom reſting upon the Subſtance of the Brain.

Above it is cover'd with the Choroid Fold, and the Vein there running thro' the middle of the Fold, to which it is faſten'd, that in Man it is eaſily pull'd off with them, becauſe it ſticks ſo little to the Subſtance of the Brain, that *Bauhinus* will not allow it to ſtick to it at all; though it appear in Brutes more manifeſtly to be united to the Brain.

Sylvius allows it alſo certain little nervous Strings; *Wharton* alſo writes, that it is enter'd by two Nerves, on each ſide one, ariſing from the beginning of the Spinal Pith, but very ſmall. But it would be a difficult thing to ſhew theſe Nerves; neither will any man eaſily perceive any Nerves in that place. Yet this, upon more diligent inſpection, I have obſerv'd, that the *Choroid*-Fold in the third Ventricle, ſends forth every way ſeveral Branches of ſmall Arteries, like ſmall white diminutive Fibers, into the incumbent Cavities of the Arch, the Buttocks and Stones, and the Subſtance of the ſtringy Protuberancies, and of the Pineal Kernel; ſo that the Fold adheres every way to the ſaid Parts, by means of theſe little fibrous Branches, and pour forth into the ſaid Subſtance the Arterious Blood prepar'd therein, and in ſome meaſure clear'd from the flegmatic *Serum*. Which little Branches, not ſo duly conſider'd by *Sylvius* and *Wharton*; their Inadvertency occaſion'd their Miſtake, and ſo they took them for Nerves, becauſe of their whitiſh colour, as do alſo the ſmall Arteries of other Parts. Neither is there any Blood to be ſeen in them, becauſe only the thinneſt and moſt vaporous part of the Blood flows ſwiftly through them, neither does it ſtay long in them; the more thick Particles flowing through the Vein that is mix'd with the Fold.

Sand and Gravel in the Kernel.

XVII. In this Kernel, ſaith *Sylvius*, he has ſeveral times found Sand and a little ſmall round Stone, about the bigneſs of the fourth part of a Pea. *Reyner de Graeff* alſo writes of Stones found in this Kernel by himſelf: *We believe*, ſays he, *that Stones are generated in all parts of the Body, more eſpecially in the Pineal Kernel, becauſe that we have above twenty times found Stones therein upon the Diſſection of Bodies as well waſted by a lingring Diſeaſe, as by violent Sickneſs; which however happens more frequently in* France *than in* Holland. Certainly theſe Stones ſhould very much obſtruct thoſe Functions which are attributed to the Pineal Kernel; yet the Diſcoverers of thoſe Stones did never obſerve that the Perſons in whoſe Pineal Kernels Stones were found, were ever diſturb'd in their Animal Operations.

The Uſe of this Kernel.

XVIII. Various are the Opinions concerning the Uſe of this Kernel. Some think it ordain'd for the ſtrengthning the *Choroid*-Fold. Others with *Galen*, aſcribe to it the Uſe of a Valve, to cloſe the Hole of the Buttocks. Others ſhut up the Soul in thoſe Streights, as in a Box, and believe it plac'd there, as in the Center of the Brain, where it collects the Ideas of the five Senſories, apprehends and diſcerns them, and from that place ſends forth the Animal Spirits to the determin'd parts through theſe certain Nerves. Which laſt Opinion many at this day ſtifly oppoſe, and others as ſtifly defend. *Carteſius* grants indeed that the Soul is joyn'd to the whole body; but ſays, that it exerciſes its Functions more particularly

and

and immediately in this Glandule, than in other Parts. *Regius* will have it to be the common Senſory, and that the Soul exiſts in that and in no other part of the Body. Thus alſo *de la Forge* aſſerts it to be the principal Seat of the Soul, and the real Organ of Imagination and common Sence; and that the breeding of Stones in it, is no obſtruction to it in its Operations; no, though it be all Stone, provided there be Pores wide enough for the paſſage of the Spirits. He adds, that though the Kernel ſhould be wanting, and only the void place left for the Arteries of the choroid Fold to empty themſelves; yet that place would be a ſufficient Seat for the Soul, the Imagination and common Sence. Certainly with the ſame Reaſon he might have ſaid, that though the Heart were wanting, yet if its place were left for the large Veſſels to exonerate themſelves, it would be a ſufficient Fountain for the ſupport of all the vital Actions; that is to ſay, that in abſence of the agent Organ, the place of the Organ would ſuffice to perform the Actions of the Organ. But for my part, I muſt ingenuouſly confeſs that theſe Niceties are more ſubtil than Subtility it ſelf. On the other ſide, *Wharton* as vainly conceives, that it only attracts the excrementitious Moiſture from the upper Thighs of the beginning of the Spinal Marrow. And thus the Uſe of this Kernel is ſtill undetermin'd.

The Choroid Fold.

XIX. 5. The Choroid Fold, which deſcending from the upper Ventricles in this middlemoſt, is expanded thro' it with a much broader and thicker Contexture than in the former, and has a Vein ſometimes ſtreight, and ſometimes double interwoven in the middle, and running as far as the large Bay of the Scythe, into which the ſmall Arteries exonerate the remainder of the Blood which is to be carry'd to the Hollowneſs. Now this Fold, ſends forth into the Arch the fibrous Protuberancies, the Teſticles and Buttocks, ſeveral ſmall Branches like diminutive Fibers; by means of which it is joyn'd to them every way; and it wraps and enfolds the Pineal Glandule in ſuch a manner that it cannot be ſeen, unleſs the Fold be broken and taken off.

Malpigius, together with *Mæbius*, believes, that the Ventricles were form'd by Nature, for no Uſe, but only by Accident; but how erroneous this Opinion is, ſufficiently appears by what has already been ſaid. For the ſervice of the three Ventricles of the Brain is very neceſſary to afford a looſe and ample paſſage to the *Choroid Fold*, and defend it from compreſſure; as alſo to receive and collect the ſerous and flegmatic Humors ſeparated by the ſmall Kernels out of the inner Subſtance of the Brain, and eſpecially out of the Veſſels of the Fold.

CHAP. VII.

Of the Cerebel, the Fourth Ventricle and the long Pith or Marrow.

The Cerebel.

I. *IN the hinder and lowermoſt part of the Skull, that is between the large Hollowneſſes of the Bone of the hinder part of the Head, lies the* Cerebellum, *by the* Greeks *call'd* μικρεγκεφαλὶς *and* ἐγκεφάλιον, *containing the ſecond part of the Brain, as it were a little and peculiar Brain, becauſe it is much leſs than the Brain; and being cover'd with both the* Meninxes, *is ſeparated from it, and on both ſides united to the long Pith for a little ſpace, and continuous with it; but in the middlemoſt lower Seat it is joyn'd to the Spinal Marrow upon the hinder part, by the intervening of the thin* Meninx; *and leſt the Fourth Ventricle ſhould gape there, it is wrapt about with the thin* Meninx *expanded as far as the Buttocks.*

Its Form.

II. *The Form of it is ſomewhat broad, and ſomething flat upon both the Lateral parts, repreſenting the Figure of a broader ſort of Globe.*

Its Bigneſs

III. *The Bulk of it is much bigger in Men than in Brutes.*

Its Subſtance.

IV. *The Subſtance of it differs not much from the Subſtance of the Brain, only that it ſeems not to be ſo ſoft, but much firmer.*

Its Veſſels.

V. *It is divided into innumerable ſmall thin Plates, repreſenting the Leaves and Boughs of Trees, and cloath'd with the thin Membrane interwoven with ſeveral Capillary Branches*

ches of the cervical Arteries, and of which the inward and middle part are of a white, the external Compaſs of a darker Colour. Through thoſe little Arteries the Blood flows to it in great quantity; the remaining part of which after nouriſhment, runs into the lateral Hollowneſſes.

The Vermicular Proceſſes.

VI. *It has two* Proceſſes, *call'd the* Worm-like Proceſſes, *which conſiſt of many tranſverſe, and as it were twiſted Particles joyn'd together with a thin Membrane, like Worms that lie in rotten Wood.* Of theſe the foremoſt prominent into the fourth Ventricle, adjoyns to the Buttocks and Stones; the hindermoſt is not altogether ſo prominent, but vaniſhes with a point into the Subſtance of the *Cerebel.* Some alſo think that theſe Proceſſes are diſtended and contracted in the elevation and compreſſion of the Cerebel.

Varolius's *Bridge.*

VII. *About the hinder part of the Trunk of the long Marrow, is to be ſeen* Varolius's Bridge, *which conſiſts of two, and ſometimes three gibbous Proceſſes on both ſides, protuberating from the Cerebel to the Circumference of the fourth Ventricle; of which, they that are ſeated near the Worm-like Proceſs are larger, the reſt leſſer.*

The Ciſtern.

VIII. *The Cerebel has no Cavities, but only a wide Hollowneſs in the middle, yet not very deep; which by ſome is call'd the Ciſtern; and this conſtitutes the higher part of the fourth Ventricle.*

The Subſtance of the Cerebel differs little or nothing from that of the Brain, and is cloath'd in the ſame manner with Membranes and a Shell, and alſo has deep Windings and Meanders, overcaſt with the thin *Meninx* to the loweſt Depths, and furniſh'd with Net-work Folds of ſmall Arteries and Veins, whence the Office and Uſe of the Brain and Cerebel is thought to be the ſame.

Willis therefore obſerving no certainty in aſcribing this Office to the Cerebel, has found out another, which he thinks to be more true and genuine. And thus, he ſays, that the Cerebel, which he takes to be a peculiar Bowel, is a peculiar Fountain and Magazine of certain Animal Spirits deſign'd for peculiar Uſes; and diſtinct from the Brain. The Office of the Brain he aſſigns to be, to afford and ſupply thoſe Animal Spirits wherewith the Imagination, Memory, Diſcourſe and other ſupream Acts of the Animal Function are perform'd; and by which all the voluntary Motions are brought to paſs. But that the Duty of the Cerebel ſeems to be to procreate Animal Spirits apart, and different from thoſe generated in the Brain; and to ſend them to ſome particular Nerves; by which unvoluntary Actions, as Pulſation of the Heart, Protruſion of the *Chylus*, Concoction of the Nouriſhment, and many others, which unknown to us, and without our conſent, are tranſacted. This new Fiction he endeavors to confirm by many Arguments, which being examin'd, are not ſtrong enough to eſtabliſh his Opinion. However, I deem his Diligence to be highly praiſe-worthy; for having undertaken to illuſtrate ſo obſcure a Myſtery with a new and ingenious Invention. For which *Fracaſſatus* greatly admires him, and believes there by the hard Queſtions about natural Motions which are done with the privity of the Brain, are excellently well reſolv'd, and that thereby many hidden things, whoſe Cauſes and Reaſons the Nature and Propriety of the Parts challeng'd to her ſelf, may be unfolded; provided the *Hypotheſis* be true, which is ſuppos'd, of the truth of the difference between the Spirits of the Brain and the Cerebel, and their various influx into the ſeveral Nerves: But the incertainty of this *Hypotheſis* appears from hence; for that Birds and ſeveral other Creatures have no Cerebel, and yet have the ſame motion of the Heart, the ſame Reſpiration and thruſting forward of the *Chylus*, &c. Laſtly, he adds, that if peculiar Spirits ſerving to unvoluntary Motions, were generated in the Brain, they cannot poſſibly paſs from thence into the Nerves of the ſixth pair, ariſing out of the long Pith much below the Cerebel: which nevertheleſs afford Animal Spirits to ſeveral parts of the Breaſt and *Abdomen*, to accompliſh the ſaid motions. He might have added, that though it ſhould be granted, that the ſaid Spirits of the Cerebel ſhould flow through the Nerves of the ſixth pair, how then ſhould it be poſſible for the Spirits of the Brain ſerving to voluntary Motions, to flow through the ſame Nerves; which Motions however are perform'd in the Muſcles of the *Hyois*, the *Larynx*, the Jaws and ſeveral other Muſcles,

Muſcles, by the help of the Spirits flowing through theſe Nerves.

Where the Seat of the Memory.

IX. The *Arabians*, by reaſon that the Cerebel is ſomewhat more hard and dry than the Brain, have made it the Seat of the Memory, and hence, as they ſay, it comes to paſs that the hinder part of the Head being hurt, the Memory becomes prejudic'd. Whom the Obſervation of *Benevenius* ſeems to favour; who relates the Story of a Thief, who being taken and puniſh'd, never remembred what he had done before: In which Thief, after his death, they found the hinder part of his Head ſo ſhort, that it could hardly contain the leaſt portion of his Cerebel. But whether this Opinion of the *Arabians* be true or no, may be judg'd by what has been ſaid already concerning the Seats of the principal Faculties.

Its Parts.

As to the Parts of the Cerebel, *Andrew Laurentius* and *Riolan* believe, that the fore part ſhuts and opens the Entrance into the fourth Ventricle, like a Valve. But in regard that of its ſelf, like the Brain, it is void of proper motion, it ſeems hardly capable of that Function; and therefore the *Varolian Bridge* is thought to cloſe the extream Circles of the Cerebel, and to defend the noble Ventricle like a Bulwark.

The fourth Ventricle.

XI. *The lower part of the Cerebel being rais'd up, the hinder part, or the fourth Ventricle diſcloſes it ſelf leſs than the reſt.* Which is form'd out of the Trunks of the Spinal Marrow, deſcending from the Cerebel, and the third Ventricle of the Brain, and ſomewhat diſtant one from another, before they are all together united; becauſe the higher and leſſer part of it is made by the Boſom of the Cerebel, overcaſt with a ſlender Membrane; but the lower and bigger part ſeems to be as it were in-laid into the long Pith, having a hollowneſs reſembling a Pen, where it is ſhap'd for writing, and therefore call'd *Calamus Scriptorius.*

Calamus Scriptorius.

Arantius calls this Ventricle the *Ciſtern*. *Herophilus* calls it the moſt principal and noble Ventricle, and affirms that the Animal Spirits prepar'd in the upper Ventricles, obtain there their chief Perfection, and thence flow thro' the Pores into the Marrow and Nerves. But in regard theſe Spirits are neither made nor contain'd in the upper Ventricles, it is apparent that the Function of generating and perfecting Animal Spirits, belongs as little to this Ventricle as to the other three, eſpecially ſeeing that neither the Matter out of which thoſe Spirits are generated, nor the Spirits made in the other Ventricles, and to be perfected farther in this, can be ſupply'd to this fourth Ventricle.

The long Marrow.

XII. *The long Marrow, which falling down without the* Cranium, *to diſtinguiſh it from the Marrow of the Bones, properly ſo call'd, is call'd the* Spinal Marrow, *and is the harder part of the Brain and Cerebel, cloſe and white, conſiſting partly within the* Cranium, *about the length of four fingers Breadth, and partly without in the Pipe of the Bones of the Spine, extended to the end of the* Os Sacrum.

The difference between this and the Marrow of the Bones.

XIII. *Though it be improperly call'd Marrow from a kind of reſemblance which it has, yet it differs in many things from the real Marrow of the Bones.*

1. In *Subſtance*; as being neither ſo fat nor ſo moiſt as this, which is like to Fat, and ſubject to run, will melt with the Fire, and takes Fire like Oyl, whereas the other will neither melt with Fire, nor flame out.

2. In *Colour*; the one being whiter than the other.

3. In the *Coverings*; the one having two Membranes and the Bones to encloſe it, whereas this is cloath'd with no Membranes, and is contain'd only in the Cavities and Poroſities of the Bones.

4. In the *Uſe*; for that the one does not nouriſh the Bones, as the other does; but ſtretches out the Nerves which are the Channels of the Spirits, to the Parts; whereas the other has no Nerves that derive themſelves from it. And therefore, for diſtinction's ſake, the one is call'd ῥαχίτης, or Spinal; by others, νωτιαῖος, or Dorſal; by others, διαυχένιος; by others, ψοίτης, as deſcending through the Neck, Back and Loyns, and filling the whole Spine. Upon theſe Conſiderations, the great *Hippocrates* diſtinguiſhes the Spinal Marrow from the Marrow of the Bones. For, ſays he, *the Marrow which is call'd the Dorſal Marrow, deſcends from the Brain; but has not in its ſelf much of Fat, or glutinous, as neither has the Brain, & therefore neither is the name of* Marrow *proper for it; for it is not like the other Marrow contain'd in the Bones, which has Tunicles alſo, which the other has not.* And *Galen*

treading,

treading the Footsteps of *Hippocrates*, affirms that the Spinal Marrow is not rightly and properly call'd Marrow. But all this Dispute is sav'd by the *English*, who call it Pith.

Its Motion. XIV. *It is mov'd also according to the motion of the Brain*, not of it self; but by the motion of the Arteries, which keeps time with the motion of the Brain, but is weaker, in regard that part is stronger, and neither so soft nor moist.

Its Substance. XV. *The Substance of it is fibrous*, as may be seen by the help of a Microscope, compacted as it were with innumerable long strings, softer above; but when it has reach'd the middle of the Breast, somewhat harder by degrees But whether those little Bodies, as well of the Brain as of the Pith, be hollow or no, and so transmit any Spirits thro' their Cavities, has been diligently examined by the Physicians of this Age; but nothing has been concluded on but only by Conjectures, by reason of the weakness of our Sight and difficulty of Demonstration.

Its Vessels. XVI. *In the dissected Substance innumerable Bloody Drops appear up and down, in like manner as in the dissected Brain*; but the Blood-bearing Vessels passing through the Substance it self, are so very minute, that they can hardly be discern'd by the Eye.

The Original also of these little Vessels, by reason of their subtility, is no less obscure. But in this quick-sighted Age, by more quick-sighted Anatomists, this has been observ'd, that much about that place where the Trunk of the *Aorta* is dispers'd into the *Subclavials*, a vertebral Artery is sent forth through the holes wrought through the transverse Processes of the Cervical Vertebers, and that from thence two little Branches proceed to the Spinal Pith; and that from thence, downward among the several knots of the Vertebers from the descending Trunk of the *Aorta*, where it rests upon the Spine, immediately two Arteries of each side one, run along to the said Pith. Which two Arteries of each of the sides, meeting together, and intermixing one among another, form a wonderful piece of Net-work in the *Meninxes*, that they also clasp one another like a Chain of Rings, and so hold each other with a winding course, by and by they are seen to send certain Capillary Branches toward the inner parts of the Pith, as *Willis* observes. Which last is manifest, from the little bloody Spots conspicuous in a dissected Substance. From the Conjunction of these little Arteries on both sides, above the middle fissure of the Pith, is form'd a more conspicuous Artery, running the whole length of the Pith; also two other Arteries of each side one, common alike, but less creep into the sides of the same Pith.

The Veins that carry back the blood remaining after Nutrition, from the Pith, and its Coverings toward the Heart, arising from scarce visible Originals, by degrees joyn together, and form a Fold like the arterious Fold, and mixt with it. From this Fold the Blood carry'd farther, flows into two larger Veins, which *Willis* calls the *lesser Hollownesses*; of which one of each side is extended within the Cavity of the Bone as far as the *Os Sacrum*. Out of these the Blood is yet pour'd into a larger Vein (which *Willis* calls the *large Hollowness*) running all along the whole length of the Spine, and receiving the Blood of both lateral Veins, as into a common Receptacle, and thro' the lateral holes of the Vertebers, conveying it to the next Veins, that is to say, the *Azygos* and the Vertebral Veins, ascending through the Neck, carries it from those to the hollow Vein; in like manner as in the Head the larger Bosom of the *hard Meninx* runs out above the Division of the Brain, and receives the Blood of surrounding Vessels to be deliver'd up to the Jugular Veins.

From this Pith all the Nerves of the whole Body derive their Original; neither do any proceed from any other part, either Brain, Cerebel, or whatever it be.

However, the Pith is not a part separated from the Brain, but a production of the same and the Cerebel, from whence, like a Stalk it springs with four Roots: For before or rather above it springs from two protuberancies of the third Ventricle, by which it is chiefly fasten'd to the Brain; behind or rather before, from the Buttocks and Stones, by means of which it more adheres to the Cerebel.

Now as I call this Pith a production of the Brain, others have design'd it out by other Appellations; for *Ruffus* affirms it to be no peculiar body of the Brain, but the purging of the Brain. *Theophilus* calls it the Brain drawn out in length; and so doth also *Peter Borel-*

lus. Others have nam'd it the *Apophyſis*; others the Proceſs of the Brain; becauſe it extends it ſelf from the Brain as from a thick Root or Trunk, and obtains continuous Fibers with it.

Yet *Protagoras* and *Philotimus* of old, ſeem'd to be of a contrary Opinion; who as *Lindan* reports, affirm'd this Pith to be no production of the Brain; but that the Brain was the redundancy of the Spinal Pith. Whoſe Footſteps *Bartholine* treading, affirms likewiſe, that the Pith is not extended from the Brain, but that the Brain rather proceeds from the Pith; from whence, as from its Root it riſes and ſhoots forth, and that it is a certain proceſs of this Pith; deducing his Argument from certain Fiſhes, the Pith of whoſe Head and Tail is of a vaſt bigneſs, but their Brains very ſmall in quantity. To *Bartholine's* Opinion *Malpigius* ſubſcribes, and extending it farther, writes, that all the Fibers diſperc'd through the Brain and Cerebel, proceed from the Trunk of the Spinal Pith contain'd within the Skull, as from an extraordinary collection of Fibers; in like manner as in Cabbages the Fibers of the Root breaking forth, are diſpers'd through the Leaves, which being wound and folded about, form the Head, by accident furniſh'd with a certain hollowneſs within, like a Ventricle; and hence it is, that he will allow the Ventricles to be of no uſe, as being made hollow by accident. Then whether the ſame Fibers in number, which are rooted in the Brain, be extended into the Spinal Pith, and there being cloſely united, make a more ſolid Trunk, or whether the Pith be a part proceeding from the Brain, the ſame *Malpigius* examins, and adds, that being taught by the diſſection of ſome Fiſh, he thinks it probable that the prolong'd Fibers of the Spinal Pith, the Brain and Cerebel are the ſame in number; and thence he believes that the Brain is an Appendix of the Spinal Pith; or elſe that the Trunk of Nerves contain'd in the Spine, propagates the Roots crookedly crawling through the Brain and Cerebel, in the ſurrounding Aſh-colour'd rind or ſhell; but that the Branches proceeding from the Head are diſpers'd through the whole Body. This is alſo the Judgment of *Fracaſſatus*; which he proves from hence; for that if you take a Chicken but newly form'd in the Egg, when it is but juſt cover'd with its Film or Cawl, and prick it with a ſmall Needle, it preſently contracts, though at that time nothing poſſeſs the Seat of the brain but the *Lympha*, not yet fix'd into brains, and thence he infers, that the Brain and Cerebel are Appendixes of the Spinal Pith. But he conſiderately weighs what we have ſaid already, *l.* 1. *c.* 29. will find that neither the Brain owes its original to the Pith, nor the Pith to the Brain, ſeeing that all the parts are delineated together in the firſt formation, and are the immediate Works of Nature, which depend in ſuch a manner one upon another, that the one can neither act or live without the other. If any one aver, that the Fibers aſcend from the Pith into the Brain, with the ſame priviledge I may ſay, that they deſcend from the Brain into the Pith; neither is it any argument againſt me, that the brain is not ſufficiently harden'd at the beginning; for that then neither is the Pith ſufficiently coagulated, but appears like a moiſt Slime. Beſides the perception of the Senſes proceeds from the brain, as being the beginning of all the nervous Fibers, and not in the Pith; for it is not the wound of the pith, but the wound of the brain that hinders and obſtructs the Perception. Nor does the Argument brought from a Chicken prove any thing to the contrary: For if at the firſt formation of the Chicken, the Film contract it ſelf upon the pricking of the Needle, that is rather a ſign that then the brain, which is the beginning of all ſenſation, and without which no ſenſation can be, was no leſs form'd than the *Pith.*

The Coverings.

XVII. *The Shape of the* Pith *is various; nor is it the ſame in all Creatures, nevertheleſs in Men it is oblong and almoſt round.* *Veſalius*, *Laurentius*, *Picolhomini* and *Spigelius* aſſert, that it is larger and thicker at the beginning, and thinner toward the end; and ſo deſcribes it in his Table affix'd: Which is deſervedly found fault with by *Fallopius*, who excellently well obſerves, that about the lower Vertebers of the Neck, and the firſt of the *Thorax*, where the great Nerves extend themſelves to the Arms, as alſo in the Loyns, where large Nerves run out to the Thighs, it is fuller and thicker than in the upper, middle or lower parts; but that in all the reſt of the parts it is every where for the moſt part, of an equal thickneſs, unleſs it be the end that lies hid in the *Os Sacrum.*

XVIII.

Its Division. XVIII. *From the seventh Vertebre of the Breast to the lower parts, it is separated as it were into several small strings, being the Productions of the Nerves in the pith of a newly deceas'd Body dipp'd in Water, and stirr'd about therein so conspicuous, so that toward the end that same vast quantity of little Strings seems in some manner to represent the Figure of a Horses Tayl.* Which *Riolanus*, who did not understand that the whole constitution of the Pith was fibrous, asserts to have been so created by God, lest the Pith of the Back being soft and juicy, as it is observ'd in the Neck and Back, should be bruis'd and broken by the continual motion of the Loins. The said divarication of the Pith toward the end into small Ropes or Strings, the learned *Tulpius* questions; For, says he, near the *Os Sacrum*, we have examin'd very diligently, but never could find those hairy strings, which *Andrew Laurentius* describes in his Tables, tho' otherwise a most credible Writer; *We met indeed in that place with Nerves more loose than in other places, but yet compact, and so closely united, that no hot Water would separate their twisted Body, as that other asserts; unless he meant by Strings those Nerves into which the extream part of this Spinal Marrow is evidently distracted.*

But ocular view opposes and resolves this Doubt; by which it manifestly appears, that the lower part of the Pith, especially that which is contain'd in the Loins and *Os Sacrum*, being beaten and stirr'd in the Water, will separate into several strings. Now the Reason why *Tulpius* did not observe that dissolution, might be, because he let the Pith lie in the Water, but never stirr'd and shook it sufficiently.

Its Cavity. XIX. *The Pith within the Skull has a Hollowness like a Pen shap'd for writing, constituting the lower part of the fourth Ventricle, and so far, to the midst of its thickness it is manifestly divided into the Right and Left part, in the same manner as the Brain is divided in the upper part:* And hence the Palsie sometimes in the Right, sometimes in the Left side. But this Division in the outside of the *Cranium*, in the Cavity of the Spine, is not conspicuous to the Eyes, because of the exterior Tunicle or hard *Meninx*, which enfolds it round about, for which Reason the whole Pith being view'd without, seems round and simple, without any division to the end of the *Os Sacrum*; though if that Tunicle be taken away, there is in reality such a division found by the intervening thin Film, and may be shew'd by neat and curious Dissection; and not only by Dissection, but by the blowing in of Wind the same division may be discover'd. Thus *Bartholine*, after a tedious Examination, *by putting a Pipe into the Hollowness above the separation, easily brought the Wind to the extream parts, so that the whole Body of the Pith, where the Division ran along, seem'd to be rais'd up.*

But this Division descends no farther than about half way of the Substance: Nor is there any other manifest Discovery to be found in any part of the Pith.

The Coverings. XX. *It is lapt about with two Membranes; of which the first, that enfolds it immediately, arises from the* Pia Mater, *which being sprinkl'd with innumerable small Arteries entring the Substance of the Pith, washes and nourishes it with Vital Blood, the remaining part of which Blood, intermix'd with little Arteries, suck up and convey back to the heart. The other Membrane sticking to the first by the means of small tender Fibers, proceeds from the thick* Meninx. *Gerard Blasius* observes a third between these two, which as resembling a Spider's Web, he calls the *Arachnoides*, and alledges that it sticks to the thin *Meninx*, and may be easily separated from it either with a Bodkin or by blowing. About these Tunicles is wrapt a strong and nervous Membrane by a strong Ligament, that binds the fore-parts of the Vertebers, which preserves the Pith of the Spine from damage in the bending and extension of the Back. Over this a thick and viscous Humor spreads it self, to moisten and smooth it, that it may be more easie to prevent pain in motion upon its being over-dry. With which Humor all the Joynts are moisten'd for their more easie Motion. *Lindan* and *Blasius* erroneously number this Membrane with the containing parts of the Pith, in regard it rather serves to bind the Vertebers withinside, than to enfold the Pith.

Besides the forementiond Coverings, the Pith is also included within a Bony Sheath, for its better preservation, the upper part of which is cover'd with the Skull.

CHAP. VIII.

Of the Mamillary Proceſſes, the Pituary Kernel, the Funnel, the wonderful Net, and the Nerves proceeding from the Pith within the Skull.

See Table 12, *and* 13.

HAving gone thus far in Demonſtration, the Brain is to be rais'd up in the fore-part, that the Parts which lie underneath may be more eaſily ſeen.

The Mamillary Proceſſes.

I. *Among the Parts that lie hid under the Bulk of the Brain, the firſt that occur to the Eye are the Mamillary or Papillary Proceſſes, ſo call'd from their Figure, which is round at the end like a Teat.*

Theſe were not reckon'd by the Ancients among the Nerves, by reaſon of the ſoftneſs of their Subſtance, and becauſe they never exceed the thick *Meninx* and the Cavity of the Skull; neither have productions like other Nerves, and therefore erroneouſly by moſt Modern Anatomiſts added to the Number of the Nerves, and ſaid to proceed from the Pith, when ocular View evinces the contrary.

Their Number.

II. *Theſe Proceſſes are two in number; white, ſoft, long, round at the end, hollow within; in men thinner and leſs, but bigger in Calves, Sheep and other Brutes.*

Their Original.

III. *Being propagated from the globous Pith, and the foremoſt Ventricles* (for *Willis* errs in ſaying they riſe from the Thighs of the long Marrow, and clad with the thin *Meninx*) *they are carry'd between the Brain, the* Os Sphœnois, *and the Bone of the Forehead, to the Hollowneſs of the Sieve-like Bone, envelopp'd with the thick* Meninx, *into which they inſinuate themſelves, the Bony Proceſs, call'd the Cocks-comb, intervening between and diſtinguiſhing them one from another.*

Little Pipes.

IV. *The thick* Meninx *inveſting theſe Hollowneſſes of the Sieve-like Bone, is not only bor'd through with many little Holes, but alſo with many little Pipes extended through the Holes of the Sieve-like Bone, and ſo opens into the Spungy Fleſh of the Noſtrils adhering to the Spungy Bones, and through thoſe little Pipes tranſmits the Flegm out of the Ventricles of the Brain, and brings it into the ſaid Spungy Fleſh and Spungy Bones of the Noſtrils, adhering to the Ventricles above, and full of the ſaid Spungy Fleſh.* Which is the Reaſon that ſomething may flow down from the Brain, but nothing can aſcend back from the Noſtrils; for that if any thing do aſcend upward, it ſtops there; partly by reaſon of the contrary ſituation of the Pores of the fungous Fleſh, and partly from the winding of the ſlender Pipes about the Extremities.

Theſe Pipes are eaſily diſcover'd in the Head of an Ox or a Calf, if the Bones of the upper part of the Noſtrils be ſo taken away, that their whole Cavity may appear; for then thoſe little Pipes are manifeſtly to be ſeen pendulous through the holes of the *Ethmoides-Bone* and extending themſelves into the Spungy Fleſh of the Noſtrils.

The Channels for the Flegm.

V. *From each of theſe Proceſſes there paſſes a Channel from the upper Ventricles, all their full length, running out to the* Ethmoides-Bone, *ſo large in the Brain of an Ox, Calf or Sheep, as to admit a Gooſe-Quill.* But in a dead man ſo very narrow as hardly it will admit the point of a Bodkin; and therefore not to be ſeen but in Bodies newly deceas'd; for if the Carkaſſes be kept for any time, the Subſtance of theſe Proceſſes grows ſo lank, that the ſaid Channel is never to be found; which is the Reaſon that theſe Channels are by many Modern Anatomiſts overſeen and not obſerv'd. And among that Number is *Veſalius*, who affirms, that no Flegm falls down thro' thoſe Proceſſes, and that there is no Paſſage within them, neither can be by reaſon of their ſlenderneſs. To his Authority *Riolanus* alſo ſubſcribing, avers that the flegmatic Filth does not diſtil through the Mamillary Proceſs and the Holes of the Sieve-like Bones; for that it would infect the pure Air which is requir'd in thoſe parts. Upon the ſame Foundations *Rolfinch* aſſerts, that he never could find any Cavity in theſe

Pro-

Proceſſes; becauſe perhaps he never examin'd other than ſtale and long kept Carkaſſes. But let us hear what *Fallopius* ſays concerning theſe Proceſſes. *It is hard*, ſays he, *to obſerve theſe Channels in Men, becauſe they are too ſlender and diminutively ſmall; but in Brutes, as Oxen, Goats, Sheep, and the like, it is eaſie to ſee, that theſe Proceſſes ariſe from the foremoſt Ventricles, and that a manifeſt Hole reaches. They have a Paſſage from the Hole to the* Colaterium *or Sieve-like Bone, which Paſſage is bigger or leſs according to the proportion of the Proceſs: For in the Proceſs of an Ox it is very large; in a Man ſo narrow, that unleſs it be in a Carkaſs newly deceas'd it is hardly to be diſcover'd. Which perhaps is the Reaſon that theſe Proceſſes have been ſo little known to ſeveral Anatomiſts.*

Their Coats. VI. *This innermoſt Cavity of the Proceſſes is very white, and envelop'd with a thin Film, common and continuous with that which overſpreads the upper Ventricles withinſide.* It is ſeldom empty, but for the moſt part full of a ſlimy and limpid Juice.

The uſe of them. VII. It is the Opinion of *Sneider* and other Anatomiſts, that theſe Papillary Proceſſes are the real Nerves proper to the Sence of Smelling; but *Galen* aſſigns them a double Uſe; firſt, to ſerve for the Smell; and partly for evacuation of the Flegmatic Excrements out of the Ventricles of the Brain. As to their firſt Uſe, *Avicen*, *Hali*, *Fuckſius*, *Bauhinus*, *Epigelius*, *Caſſer* and ſeveral others ſubſcribe to his Opinion, affirming theſe Proceſſes. But as to their evacuating Function, few of them make any mention of it, though indeed it be their primary and only Office.

Not Odoratory Nerves. VIII. For that they are no Odoratory Nerves, there are many Reaſons to prove.

1. They have no Reſemblance with the Nerves.

2. They have a large Cavity, which is not to be found in any Nerves.

3. They do not riſe from the Pith, which is the Original of all the Nerves.

4. They do not proceed from the thick *Meninx* and the *Cranium*, nor ſend forth any nervous ſtrings into the Membranes of the Noſtrils, which is the Seat of Smelling; but only empty Flegm through the little Holes of the *Ethmoïs-Bone* into the ſpungy Bones of the Noſtrils. Beſides, a Nervous Organ full of Excrements, would be improper for that Uſe; as it happens alſo in all other Nerves, whoſe Office is prejudic'd by the Moiſture and Obſtruction of Flegm. But in theſe Channels Flegmatic Humors are always ſtagnant, either in a greater or leſſer Quantity; and that alſo in Dogs, which are Creatures endu'd with a moſt exquiſite ſenſe of Smelling, and yet receive not any impediment in their Smell from thence. Neither in Man is the Senſe of Smelling prejudic'd by a moderate Quantity of Flegm ſticking in theſe parts; but if ſo great a Quantity be gather'd together in the ſpungy part of the Noſtrils, ſo as to make it ſwell like a Spunge, by which the Nerves of the Noſtrils and Membranes are compreſs'd, and free Reſpiration hinder'd, then the Smell is diminiſh'd and hinder'd, as is known to happen in a Poſe.

Manifeſt it is therefore that theſe Proceſſes are no Odoratory Nerves, but only Channels through which the Flegmatic Excrements flow from the foremoſt Ventricles of the Brain; which ſlip out at their Extremities through the Poroſities of the thick *Meninx*, and the Sieve-like and ſpungy Bones, to the Noſtrils and Mouth; which Poroſities are ſo ſmall, that the Flegm more rarely flows out of it ſelf, only when it is very thin; but for the moſt part is ſqueez'd out through the compreſſure of the Brain; which is done, leſt the cold Air breath'd in, ſhould enter the Cavities of the Brain, & ſo that moſt noble Bowel be overmuch refrigerated. To which purpoſe the ruddy ſpungy pieces of Fleſh are ſo conſtituted, that they give a paſſage, 'tis true, to theſe flegmatic Excrements, but permit no ingreſs of the aſcending Air to the Sieve-like Bone; becauſe upon breathing in the Air, by reaſon of their ſoftneſs, they fall down and ſhut, and hence they allow no paſſage for the Odour-bearing Vapour to the Papillary Proceſſes; but exclude and drive it out. From hence it is manifeſt how greatly *Rolfinch* is miſtaken, who writes that the Air breath'd in, partly enters the Ventricles of the Brain through the Papillary Proceſſes, and partly through the ſides of it reaches the thin Membrane; neither of which can be, ſeeing that the ſpungy Fleſh of the Noſtrils hinders the entrance of any Air to the Papillary Proceſſes.

Therefore the flegmatic Humors collected in the Ventricles of the Brain, are evacuated through theſe Proceſſes; which, when they have paſſed, a good part

part deſcends to the Jaws and their Glandules, to moiſten the Jaws, *Larynx* and Gullet, and to afford plenty of Spittle for the better concoction and paſſage of the Meat in ſwallowing. But that which remains of theſe flegmatic Humors and is moſt ſuperfluous, flows toward the Noſtrils and Palate, partly to moiſten the inſide of the Mouth and Chaps, and partly to mix a fermentaceous quality with the Meat when chew'd, and partly for the remainder to be evacuated forth. Theſe Vapors upon the too much refrigeration of the Head, are collected many times more crude and copious, in regard the Vapours aſcending from the inferior parts, for want of ſufficient heat, are not diſſipated nor ſufficiently concocted; but being condenſed, turn into ſlimy Snot, which when by reaſon of its viſcoſity and redundancy, it cannot paſs through the ſtreight paſſages of the Sieve-like Bones, and the ſpungy Poroſities of the upper part of the inſide of the Noſtrils, cannot be either ſuddenly or conveniently enough evacuated, occaſion an Obſtruction in thoſe Paſſages, which is call'd *Gravedo* or the Poſe, which the immiſſion of *Errhines*, by their inciſion and attenuation of the Humors diminiſh, and Sternutories evacuate; when the Membranes of the Brain, the Membranes of the interior Noſtrils being twing'd by their Acrimony, and irritated by Sympathy, ſtrongly and forcibly contract themſelves, and ſo by compreſſing the Brain, ſqueeze out the flegmatic Humor contain'd in the Brain through the obſtructed Paſſages, by a kind of violence.

Nerves within the Cranium.

IX. *After theſe Proceſſes, you preſently come to the Nerves, which proceed all from the Pith, ſome while it is yet included in the Brain, and other while when it is fallen down out of it.*

The ſeven Pairs.

X. Of the firſt Primary Nerves, according to *Galen*, there are reckon'd ſeven Pairs, or Yoaklings together. Which Number the more Modern have augmented to eight, nine and ten, or more Pairs; reckoning in not only the Larger and Primary Nerves, but alſo all the Little Nerves, which *Galen* takes only for the Strings of the Larger, and dividing them into Pairs.

Theſe ſeven Pairs are uſually comprehended in theſe Verſes;

Optica prima, Oculos movet altera, tertia guſtat;
Quartaque, quinta audit; Vaga ſexta eſt, ſeptima Lingua.

But becauſe theſe Pairs proceeding out of the Pith, before it falls out of the *Cranium*, uſe to be ſhewn, after the Demonſtration of the Brain, we ſhall obſerve the ſame Method in this Chapter, leaving the reſt of the Nerves proceeding from the Pith of the Back to another Place.

XI. *The Papillary Proceſſes being remov'd, preſently comes in ſight the firſt pair of Nerves, call'd the* Optic Pair; *conveying Animal Spirits conducing to the Faculty of ſeeing, to the Eye, and reverberating back the Beams of Viſible things to the common Senſory; which is the chiefeſt among all the Pairs, but ſofter and more porous than the reſt.* This Pair is ſaid to riſe more behind, from the beginning of the Pith, where the two Thighs of the Arch are ſtretch'd forth. But if its production be more diligently examin'd, beginning from the Eyes themſelves, it will appear, that that pair takes its original from the ſtringy protuberances ſeated in the third Ventricle; for it moves forward from the Eyes to mutual conjunction; hence being ſeparated again, it runs directly to the ſtringy Protuberances; nay it grows and cleaves on both ſides to their ſides, and putting off its inward enfolding Tunicle upon the inner ſide, next toward their ſubſtance, is immediately united with them, and ſo intermix'd with their Subſtance, that Reaſon ſeems to perſwade us that it has its own Fibers continuous with their Fibers. And ſo it proceeds all along the outſide of theſe Protuberances, to the Hole of the Arſe, in which place the outward Face of both the Optic Nerves concurs in the middle of thoſe Protuberances, and turns back again upwards, and ſo jointly aſcends as far as the top of thoſe Protuberances; and there again they ſeem to be turn'd backward again, and ſpread forth, and ſo form an Arch; which *Riolanus* obſerves, though he ſets not forth their whole Courſe ſo exactly. The Optic Nerves in the middle way are joyn'd above the Saddle of the *Sphœnoides*-Bone; which Conjunction *Bauhinus*, *Mercatus*, *Sennertus* and many others believe to be not only a

The firſt Pair. Optic.

baſe

bare Touching, but an abſolute Confuſion of Subſtances together, that there may be a more eaſie paſſage of the Spirits from one Eye to the other, not only to augment the Sight in ſound people, but alſo in thoſe that have but one Eye, whoſe ſingle Eye requires to equal the Sight of two. Which Opinion *Baptiſta Porta* defends with ſeveral plauſible Reaſons. Others believe theſe Nerves not to be confounded together, but to cut each other in the form of a Croſs, ſo that the Right Nerve runs to the Left Eye, and the Left to the Right; but this Sentence no Demonſtration confirms. *Riolanus* tells us, that theſe Nerves are joyn'd only by bare Contaction, by means of a little Swath or ſmall Channel caſt between in the form of an H. For my part, I rather think that without any Band put between, theſe Nerves at their Meeting grow to their Membranes firmly and mutually: Which not only ocular View ſeems to teach us, but it is that alſo which has been confirm'd by ſeveral Obſervations of Anatomiſts. For *Veſalius*, *Aquapondens* and *Valpenda* write, that they have ſometimes obſerv'd theſe Nerves ſeparated through their whole Courſe, but commonly united to the Membranes, when they meet. And *Lindan* tranſcribes a pertinent Hiſtory to this Matter out of *Ceſalpinus*. *Once, at a Diſſection, one of the Viſory Nerves*, ſays he, *was found lank and fall'n, the other full; but the Sight was weak in that Eye to which the extenuated Nerve was carry'd; for the Party was wounded in his Head near that part; but the extenuated Nerve did not proceed to the oppoſite part, but was turn'd back to it.* This was ſeen at *Piſa*, in the Year 1590. *from whence all the Spectators inferr'd, that the Viſory Nerves did not croſs one another, but meet and return back to the ſame place.*

Veſalius alſo tells us of a Woman that was hang'd, who had loſt her right Eye from her youth; in which Carkaſs the right Nerve was ſeen to be thinner all the length of its Courſe and redder than the left.

Now ſuch Obſervations as theſe, wholly deſtroy all theſe Opinions of interſection and intermixture of the Subſtance.

After theſe Nerves are ſeparated from their Conjunction, prepar'd on both ſides through the Hole of the Wedge-reſembling-Bone, the one runs forward to the right, the other to the left Eye, and enters the very Center in Men, but in Brutes the more lateral part.

Their Coats.

XII. *This Pair within the Skull, is overlaid only with a thin Membrane or Film, but coming forth of the Skull, it aſſumes a thick Membrane alſo from the Holes of the Bones through which it paſſes, to the very Eyes; out of which Membranes and the middle Marrowy Subſtance, ſpread in order together about the bulbous part of the Eye, are form'd the three Coats or Tunicles of the Eye.*

Galen, following the Opinion of *Heorphilus*, affirms, that the Optic Nerves are hollow, and that they have a manifeſt hole; and *Plempius* preſcribes the manner of Diſcovery. But I muſt ingenuouſly confeſs, that I never obſerv'd this Hollowneſs yet; though I have made uſe of *Plempius*'s Method; nor could *Carpus*, *Veſalius*, *Falloppius*, *Columbus*, *Valverda*, *Aquapendens*, nor ſeveral other moſt excellent Anatomiſts. For their Subſtance ſeems to be thick and cloſe, which though like that of other Nerves, it be conſtituted of ſeveral ſtrings by the Benefit of a Membrane growing together, as *Coiter* well obſerves; yet is it in this different from other Nerves, that it is ſomewhat porous in the middle, and ſeems to contain ſomething of a Marrowy Subſtance in thoſe Pores. For in a Carkaſs newly deceas'd and full of Juice, if diſſected athwart, the Optic Nerve be preſs'd with the Fingers, there will come forth a little conſpicuous Moiſture; but it is a difficult thing for any man to imagine any ſuch conſpicuous Cavity as *Galen* ſpeaks of. See more of this, *l.* 8. *c.* 1.

The Courſe or Subſtance of the Strings

XIII. Rolfinch *advances ſomething new concerning the Courſe of thoſe Threads.* For he writes, that the Threds in other Nerves run forth with a direct Courſe all the length of the Nerves, but in the Optics are crookedly twiſted one with another. He adds, that he read with admiration in *Eukachius*, and found it to be ſo in the Optic, that it was folded like a thin Matron's Kercher, into innumerable wrinkles, diſtributed in the ſame order, and bound about with a Tunicle encloſing thoſe Pleights, and that the whole might be unfolded into a large Membrane. Something like this *Malpigius* ſaw and deſcribes in the Sword-Fiſh; but he adds, that he could not diſcover thoſe Foldings in the Optic neither of an Ox, a Goat, or a Hog, though ſlightly boil'd, for the more diſtinct diſcerning them by his Microſcope; but as it were

were a bundle of little Twigs, which being ſqueez'd with a round orifice, ejected the ſoft Subſtance of the Brain, and cloath with their proper Tunicle deriv'd from the *Pia Mater*, carry along with them certain bloody Veſſels, and that out of theſe, if the Optic were ſqueez'd in a new kill'd Creature, drops of Blood would burſt forth from the Spaces of thoſe Bodies; but that the ſaid Threds are as it were bundl'd up together by the hard and thin *Meninx* enveloping the whole Nerve. *Fracaſſatus* believes, that the ſaid Threds of the Optics which he calls Fibers, ariſe by continuation, as from Roots, from the ſmall Fibers of the Brain, and only differ in this one thing, that their Originals are to be deriv'd from the ſmalleſt, and conſequently the weakeſt beginnings. This he not improbably conjectures, though by reaſon of the extraordinary ſlenderneſs of the ſmall Fibers of the Brain, and the weakneſs of our Sight, that which Reaſon ſeems to dictate, cannot be diſcern'd. As to thoſe complications of the Threds of which *Rolfinch* ſeems to write in general, without any diſtinction of Creatures, as if they were in all Animals, I believe 'tis a thing to be deny'd, that they are to be diſcern'd in all Creatures, ſince that beſides my ſelf, many others never obſerv'd them either in Man, Sheep or Oxen; and for that the Optic, like all the other Nerves in the ſaid Animals are compos'd of ſtreight Threds. If by chance it be otherwiſe in ſome Fiſh, it may be ſo; and *Malpigius*'s diligence has clear'd that Point; but from thence no general Rule can be deduc'd.

The Pituitary Kernel.

XIV. *This Pair being taken away, the Pituitary Kernel comes in ſight, ſo call'd from its Uſe, which is to receive the flegmatic Humors collected in the third or middle Ventricle, and to ſend them down to the Jaws and Palate through the neighbouring Holes.* Or which our modern Anatomiſts conceive to be the better Opinion through the Veiny or perhaps Lymphatic Veſſels, to pour them not into the Jaws and Palate, but into other Veins, and there to mix them with the Veiny Blood; in like manner as it happens in moſt other Kernels, whoſe collected Humors are ſuckt up and carry'd off through peculiar Lymphatic and Salival, or other Veſſels, and remix'd with the ſanguineous Maſs. And ſo this Kernel call'd the Pituitary Kernel, is ſo call'd from this Function aſſign'd it, which whether it be its true Function or no, we ſhall afterwards enquire.

Its Veſſels.

XV. *It borrows ſmall ſlender Arteries from the* Carotides, *and ſends little Veins to the Jugulars.* The Inſertion of the Arteries appears by the injection of Ink into the *Carotis*; for then the exterior part of the Kernel being furniſh'd with ſeveral ſmall Veſſels, will be dy'd of a black colour. And becauſe the Liquor continually flowing into it through the ſmall Arteries, cannot all be contain'd nor ſpent within it, therefore the ſuperfluous part is again evacuated through other paſſages, and as is now adays thought flows down thro' little Veins to the Jugulars. Beſides theſe Blood-bearing Veſſels, *Wharton* aſſigns to this Kernel, Nerves from the Net-reſembling Fold; of which nevertheleſs there does not ſeem to be any need at all in this Kernel.

Its Situation.

XVI. *It is ſeated under the* Meninxes, *in the Cavity of the* Spœnoides-Bone, *which is generally call'd the* Horſes-Saddle; as repreſenting in ſome meaſure the figure of a Saddle; for it is depreſs'd above ſomewhat concave; below gibbous and almoſt fourſquare.

Its Subſtance.

XVII. *The Subſtance of it is harder and more compacted than that of other Glandules; and next it is overcaſt with a thin Film proceeding from the Funnel, expanded round about it, which a portion of the hard* Meninx *covers, by which this Kernel is faſtned to the Saddle, not only in Men, but in Hogs, Calves and Oxen.* Which Connexion however in other Creatures is not alike cloſe and firm; for in Cats, Conies and Dogs it is ſo looſe, that upon removing the Funnel, it often comes away with it.

Its Diviſion.

XVIII. *The Bulk of the Subſtance in Men and Calves ſeems to be united and individual; but in Cats and Dogs it ſeems to be compos'd of two eaſily ſeparable and diſtinct Kernels.*

Its Bigneſs.

XIX. *With this Kernel not only Men, but all perfect Creatures are furniſh'd; but the proportion of its quantity varies according to the Bulk of the Creature.* For many times it is not

Serum can by no means flow out of it ſideways, or if it ſhould flow out, whither ſhould it paſs? For there is no Part near to which it can ſafely deſcend without an extream prejudice to the Part. If you'l ſay, that the Flegm not ſo large in larger Creatures as in leſſer. And where it is largeſt, there moſt Branches of the Carotid Arteries enter into it, and the wonderful Net is very large, as in Oxen and Sheep. Where it is leſs, there fewer Arteries approach it, and the Net is thin and narrow, as in Men and Horſes; and hence it ſeems probable, that either through the greater quantity of Arteries, or through the greater neceſſity of its Uſe, that in ſome Creatures it is bigger, and for contrary Cauſe leſs.

XX. *Into this Kernel the* Choana *or* Infundibulum *or Funnel terminates; ſo call'd from its reſemblance:* firſt is an orbicular Cavity with a wide Orifice (therefore by ſome call'd *Pelvis* or the Baſon) beginning from the middle hole of the third Ventricle, and ending with a long and narrow channel inſerted into the Pituitary Kernel.

It is form'd out of the *Pia Mater*, where it enfolds the *Baſis* of the Brain, and is of a dark colour, and uſes to be found full of Flegm; which it was thought to tranſmit to the Kernel.

XXI. *Round about the Pituitary Kernel at the ſides of the Saddle is ſpread the wonderful Net; by others call'd the* Net-reſembling Fold, *ſo call'd from its artificial and admirable Net-work Contexture.*

It is chiefly conſtituted by the Carotid Arteries, aſcending the ſides of the Neck to the Head, and through the Gapings of the *Cranium*, entring the *Cranium* near the optic Nerves; with which at the lower part ſome few Branches are mix'd from the *Cervicals*; for both the *Carotides* meeting together at the bottom of the Brain near the Saddle of the *Sphænoides*, are wonderfully interwoven with Branches together with ſome few Branches of the *Cervicals*, form this Fold.

Wolæus thinks that ſome Branches of the Jugular Veins are intermix'd with this Fold, which carry back the ſuperfluous Blood; deny'd by *Rolfinch*, who will not allow it to conſiſt of any thing but Arteries. Reaſon ſupports *Walæus*; but Ocular View backs *Rolfinch*, in regard no notable Veins can be diſcern'd to be interwoven with the Arteries, and theſe ſo few, that they are not to be compar'd in number with the Arteries,

This Fold is manifeſtly to be ſeen in Calves and many other brute Creatures, and ſhews in them as it were a contexture of many Nets woven together, but ſo joyn'd together in a contin'd *Series*, that they cannot be ſeparated: But in Man it is ſlender and obſcurely diſcern'd, ſo that oftentimes it ſeems to be miſſing; which was the Reaſon that *Veſalius*, *Fuchſius*, *Jalverda*, *Carpus*, *Ingraſſius* and *Wepfer* aſſerted that it was not to be found in Man. Nevertheleſs *Varolius*, *Picolhomini*, *Maſſa*, *Sylvius*, *Riolanus* and others allow this Fold to be really in Man, and tell us the way how to diſcover it. For my part, I have frequently found it in newly deceas'd Bodies, full of Blood, and not emaciated with long Sickneſs, but very ſlender, and in nothing ſo conſpicuous as in a Calf or a Sheep.

XXII. *The Uſe of this Net is to ſtop the impetuous influx of the Blood of the Brain, and to break the Current of it by theſe innumerable Windings and Turnings.* Which Influx being more impetuous in Brutes that look downwards, than in Man that walks with his Head upright, there this Net is more uſeful to them than to men.

From this Net the Branches of the Carotid Artery aſcending yet farther, enter the upper Ventricles at the lower hindermoſt part, and form in them the *Choroid Fold.*

XXIII. *Now to return from the wonderful Net to the Pituitary Kernel, which ſeems to be fram'd for the ſake of this Net, we have already told you the common Opinions of the Uſe of it; but whether true or no, we ſhall now enquire.* And I think one Argument may do the Work; for if it receive the Flegm continually flowing through the Funnel from the third Ventricle of the Brain, of neceſſity it muſt diſcharge it again through other Paſſages and to ſend it to other parts; but there are no other paſſages through which, nor no other parts that evacuation can be made, *ergo*, &c. The *Major* is unqueſtionably true: The *Minor* is prov'd, becauſe the *Horſes Saddle* conſiſts of a ſolid and thick Bone, no where bor'd through or pervious. The Kernel alſo it ſelf is cover'd with a hard *Meninx* or Membrane, and firmly faſten'd to the Saddle, which Membrane no where lies open, but only in that place where the Funnel approaches to the Kernel; ſo that the *Flegmatic*

may be evacuated out of the Bony *Saddle* or hard *Meninx*, that's to aſſert that a Camel may paſs through the eye of a Needle For if we were talking of the moſt ſubtle Spirits, ſomething might be allow'd; but that this viſible and thick Liquor ſhould paſs through inviſible pores, is beyond all Belief. As to the Veins and Lymphatic Veſſels ſucking up that *Flegmatic Serum*, and pouring it into the larger veins, there was never any *Anatomiſt* yet ſo quick-ſighted as to demonſtrate any ſuch Conveyance of a Veſſel. And therefore of neceſſity that Opinion muſt fall to the ground. Now then we muſt find out another more probable uſe of this Kernel; which is not to receive the Flegm falling out of the middle Ventricle of the Brain, but rather to ſeparate a part of the *Flegmatic Serum* from the Arteries of the *wonderful Net*, and tranſmit it to the middle Ventricle through the Funnel that lies above it, that ſo aſcending to the ſuperior Ventricles, it may flow through the Papillary Proceſſes to the Noſtrils and Roof of the Mouth. It is well known that the *Choroid Fold* has ſeveral ſmall Kernels intermix'd between the divarications of the little Arteries, which we grant to be appointed to drain out the ſerous Flegm from the Blood of their Veſſels, and then to empty it into the Cavities of the Ventricles. But the wonderful Net, which conſiſts of many more little Arteries, has none of theſe ſmall Kernels to drain out the *Serum*; yet becauſe the Arterious Blood was to be there prepar'd for the making of Spirits, and freed from ſome part of the ſerous Flegm, the *Chief Creator* inſtead of thoſe ſmall Kernels, has allow'd it one large Kernel in the middle of it, that is to ſay, in the Cavity of the Bone of the *Horſes Saddle*, and in ſuch a place where the ſeparated Liquor may conveniently be diſcharg'd into the Ventricles of the Brain, and ſo be empty'd through the common paſſages which are the Papillary Proceſſes. Then that certain Arteries enter the Kernel, as it were to diſcharge ſomething into it, is apparent from the Experiment of Injection recited. Nor let any man think the aſcent of the Humor to the middle Ventricle ſeated above the Kernel to be difficult; for the Brain by its alternate heaving and falling, by degrees gently draws upward whatever Humors are contain'd within the *Cranium*, through the Paſſages appointed for every one, and among the reſt of the Humors, the Flegmatic *Serum* flowing out of the ſaid Kernel into the Funnel; and hence it is, that the Funnel below continually receiving as much as it empties into the Ventricle above, is never empty, but is always found full of Flegmatic *Serum*. And that this is the true Office of this Kernel, is apparent from hence, that it is leſſer or bigger as the neceſſity of its Uſe requires; bigger in thoſe Creatures that have a larger *wonderful Net*, and to which more little Arteries come; leſſer in thoſe that have but a ſmall *Net*, and where fewer Arteries encompaſs and enter the Kernel, which afford a leſs quantity of Flegmatic *Serum*.

The ſecond Pair moving the Eyes.

XXIV. ***After the Demonſtration of theſe, the ſecond Pair of Nerves comes in view, which lies next to the firſt Pair, but much leſs and harder.*** This riſing near the firſt at the innermoſt part of the Pith, where it begins is united, and by and by ſeparated, is carry'd on both ſides through the ſecond Hole of the *Spænois-Bone*, and aſſigns Branches to the Muſcles of the upper Eye-lid and Eye. Moreover, *Fallopius* obſerves, that ſome certain ſlender Fibers of this Pair, accompanying the Viſory Pair, are diſſeminated into the exterior Membranes of the Eye.

The Third Pair.

XXV. ***The third Pair adjoyning to the foregoing Pair, ariſes from the ſide of the beginning of the Pith, with a ſmall Nerve (erroneouſly thought to be the Root of the ſecond Pair, with which it has no communion or conjunction) and thence is carry'd under the bottom of the Brain directly forward, and being alone, perforates the thick*** Meninx ***on both ſides, and then joyn'd to the ſecond, and proceeding forth with it through the common Hole, it enters the Path leading to the Eye, where it is diſpers'd into four little Branches.*** The firſt of theſe is carry'd through the Fat of the Eye, and comes to the Fifth or Troclear Muſcle, the Skin of the Forehead and the upper Eye-lid. The Second, through the proper Hole bor'd through the Bone of the Jaw, and proceeds to the Lip and its Muſcles, and ſome Muſcles of the Noſe. The Third, partly through the Hole of the upper Jaw ſeated under the Path of the Eye; partly paſſing through the Holes of the Wedg-reſembling Bone, is diſpers'd through the Tunicles cloathing the Cavity of the Noſtrils, and the ſpungy Fleſh, conferring the Sence of Smelling to them, and ſtretches out a little Branch to the Muſcle contracting the Wing of the Noſe. The Fourth is inſerted into

the inner part of the Temporal Muſcle; whence it comes to paſs that the Forehead, Eyes and outward part of the Noſe contract themſelves by conſent upon any ungrateful Smell: But no part of this Pair comes to the Tongue, or to its Tunicles, ſo that 'tis a wonder that the ancient Phyſicians and ſome of their modern Admirers ſhould think this Pair to be ſerviceable to the Taſte; which it neither is nor can be, but only conduces to the Smell, as not entring the Tunicles of the Tongue, but of the Noſtrils; which was the Sence of *Galen*; with whom *Veſalius* agrees, when he writes, that the inner Tunicle of the Noſtrils is form'd by the foreſaid third little Branch of this Pair. And therefore I think the old Verſes that aſcribe the Taſting Faculty to the third Pair, ſhould be thus mended;

Optica prima, oculos movet altera, tertia odorat;
Quarta eſt quæ guſtat; quinta audit; ſed vaga ſexta;
Septima laxatas Linguæ moderatur habenas.

Veſlingius adds a little Nerve to this *Third Pair*, which riſing from the bottom of the Brain and entring the Path of the Eye, is carry'd to its Trochlear Muſcle; but this ſeems rather to be the firſt Branch of the ſecond Muſcle already deſcrib'd.

The fourth Pair ſerving to the Taſte.

XXVI. *The Fourth Pair follows, which is* Bartholine's *Fifth; and thought to be the thicker Root of the Third Conjugation.*

This, with the foregoing Pair, ariſing from the ſides of the Pith, but a little more to the fore-part, ſends forth firſt of all a ſmall Branch to the Cavity of the Ears, which obliquely enters the *Tympanum*. Then on both ſides it deſcends through the third hole of the Wedge-reſembling Bone; and then after it has diſpers'd its Branches to the Muſcles of the Temples, the Face, the Cheeks, the Skin of the Face, the Teeth of the upper Jaw and the Gums, is carry'd to the inner hole of the lower Jaw, and affords little Branches to the Roots of the lower Teeth, and then paſſing out at the outward hole of the ſame Jaw, ſeated below, it is diſpers'd into the lower Lip and the Skin of it. The remarkable Branch of this Pair that remains, paſſing through the Muſcles that lie hid in the Mouth, is diſpers'd into the ſides of the Tongue and through its Tunicle.

To this fourth Pair there joyn two ſlender and hard Pairs, though generally excluded out of the number by reaſon of their ſlenderneſs; of which the firſt, which others think to be the ſlender Root of the Fourth Couple, has its Original next to the former Pair, iſſuing out with it through the common hole, yet not united, is carry'd to the Palate, and conduces to the Sence of Taſting. The latter riſes a little before the Fifth Pair, whence by many it is ſaid to be the Root of the Fifth Pair, from the middle of the Pith, and paſſing over the third pair, and iſſues out through the common hole together with the ſecond and third pair, and waſtes it ſelf into the Muſcle that draws the Eye on one ſide.

The fifth Pair ſerving to the Hearing.

XXVII. *Next follows the Fifth Pair, call'd* ἀκουστικὸν, *or* Auditorium, *conducing to the Sence of Hearing.*

This riſes from the lateral parts of the Pith, to which the Bridges of the Cerebel are oppoſite, next to the ſides of the former, a little lower. Coming of each ſide to the Stony Bone, it is divided into two Branches; of which the greater and ſofter enters the proper Channel of the Stony Bone, or the firſt hole of the Bone of the Temples, and provides for the Organ of Hearing. The leſſer, which is the harder, is carry'd downward, and ſliding through the Hole, call'd the *Blind Hole* by the Ancients, without the Skull, between the Teat-reſembling proceſs and the *Stytoides Appendix*, diſpences little Branches to the Temporal Muſcle, as alſo to the Muſcles of the Jaw and *Larynx*, to the Chaps and Skin of the outward Ear. *Rolfinch* however affirms, that he has not always found that diſtribution to the *Larynx* always conſtant & ordinary; neither does *Veſalius* ſeem willing to admit it. *Riolanus* obſerves that the ſame Nerve iſſuing out of the *Cranium*, not only provides for the aforeſaid Muſcles, but alſo ſends ſome little Branches into the Noſtrils and Cheeks, and from thence the greateſt part of it is carry'd to the Roots of the Teeth, the *Larynx* and the Tongue. Nevertheleſs he adds, *Hence it is that deafiſh people are ſomewhat hoarſe, and that a violent and cloſe ſtopping of the Ears ſtops great Fluxes of Blood. Hence the Teeth are ſet on edge with grating ſounds, and that naturally dumb People are deaf, and deaf People ſubject to pant; that People that dig in their Ears very hard, cough; and that the Ears of* Peripneumo-

nics *are always moist; all which things happen by reason of the Communication of the Nerves of the Fifth Pair with these Parts.*

This brief Description of the fifth Pair is obvious in Demonstrations; but they who endeavour to deliver a more exquisite Description of it, and its farther Distribution through the Organs of Hearing, do not all agree one with another; neither in Dissections do the Distributions of the Nerves occur alike in all Bodies, Nature sporting and varying as well in these as in several other parts of the Body.

Eustachius, concerning this Matter thus writes; *The Fifth Pair of the Nerves of the Brain does not consist of two Nerves as others believe: but has two unequal stalks, on each side, of which the biggest is neatly hollow'd to the full length like a Semicircle, and kindly embraces the less; and so being both joyn'd together, proceed obliquely to the foremost and exterior part, as far off the extream part of the Hollowness, bor'd through in the Stone-like Bone for their sakes; where the lesser stalk separating from the bigger, finds a little hole prepar'd for it, and enters it, and with a wonderful winding course shoots forth without the Skull. The bigger stalk seems to be divided into three portions little distant one from the other, of which the principal is* Caps, *a little hole pervious into the Cochlear-Bone; but whether it cover it like a Pot-lid, or pierce any deeper, and be twin'd about within the Snaky Curles of that Bone, I could not well examin, because of the difficulty of handling those Parts.*

Fallopius explains the same thing somewhat otherwise. *The first Pair*, says he, *assists the Hearing, consisting of two Nerves; the one, than which there is no Nerve more soft except the Visory, design'd to the Sence of Hearing; the other, which is also assign'd to the fifth Pair, because it arises from the same place with the softer, and reaches together with the same to the Stone-like Bone; but indeed it is a distinct Nerve, and harder than the former, and equally as hard as the rest of the Nerves which form the rest of the Pairs; nor will any Reason allow it to be a part of the soft one. The other portion of the fifth Pair, which is soft and by me call'd the* Hearing-Nerve, *coming together with the hard one to the extremity of that Den by the means of certain very narrow middle holes, is distributed into two Cavities; of which the one is by me call'd the* Labyrinth; *the other, the* Spoon, *or* Spoon-like Portion; *neither does it proceed any farther, or send any Nerve from its self to the exterior Parts.* And *Coiter* testifies, that he has often found it, as *Fallopius* describes it.

Vesalius differing from *Fallopius*, thus answers, *That Difference by thee observ'd in the hard and soft Original of the fifth Pair, or of its being carry'd to its proper hole, I have not as yet discover'd: For there is no nearer way whereby the foremost Portion of the Nerve of the fifth Pair can be carry'd or distributed to the beginning of the Den, which I compare to the Chamber of a Mine. And though you describe the hard Portion of the fifth Pair, as if it were of no Use to the Organ of Hearing; yet you must take notice that it produces a stalk that runs through the hole, peculiar to the vaulted Den. Besides, when I observe the Hole admitting the fifth Pair, and see that there is a passage to be met with in the foremost Seat of it, which ends at length, I cannot understand, how you, while you divide the fifth Pair into soft and hard, and assert the hard Portion to be slenderest, and seated behind the other, can expect it should enter the said Passage without some kind of crossing and running athwart, which would prove the course and situation of your hard Portion above and soft one below: For to my sight, the former and not the hinder part seems to enter the said Passage, which ceases in the* Blind Hole *under the Ear toward the hinder parts.*

Here *Vesalius* describes an exact Distribution of the fifth Pair of the Nerves, though it be a difficult thing to demonstrate it so exactly in a dead Body, especially for those that are over-hasty in Dissection; so that it is only a Labour to be perform'd by sharp-sighted, dextrous and patient Anatomists.

The Vagous Pair.

XXVIII. *The Sixth Pair, which provides for many Parts in the middle and lower Belly, and thence call'd the* Vagous or Wandring Pair, *arises a little below the fifth Pair, cover'd over with strong Membranes, by reason of its longer Course, and connex'd to the neighbouring Parts.*

At the Beginning it is compos'd of several little Nerves and Fibers, which Fibers are presently so united and cover'd over with the same Membrane, that they seem to constitute one Nerve.

Between

Between these little Nerves collected together by this Union, in each of the vagous Nerves there is one, which arises not from the Pith within the *Cranium*, but from the Pith of the Neck (for which Discovery we are beholden to *Willis*) from which place along the sides of the Pith, into which it is never all the way inserted, but only fasten'd by thin Fibers, it ascends upward toward the Head, and increases in Bulk; hence carry'd to the inside of the *Cranium*, it is fasten'd to the Fibers of the fifth Pair, and with those issues forth at the same hole, so that you would think they grew together into one Trunk.

After their Egress, being again separated from the Trunk of the vagous Nerve, it reflects back and afterward imparts certain little Branches to the Muscles of the Neck and Shoulders, descends to the Scapular Muscle, and in that is almost all consum'd; pouring Animal Spirits into it for the motion of the Arms in Men, the Fore-feet in Beasts, the Wings in Fowl and the Fins in Fish; for in these Creatures also has *Willis* observ'd Productions of the said Nerve. And therefore because the Motions of the Arm require strong Muscles, it is requisite that it should arise from the Pith within and not without the Brain.

This vagous Pair being compos'd of the said little Nerves concurring together, issues out of the *Cranium* through the third hole common with the hinder part of the Head to the Bone of the Temples (through which also passes the bigger Branch of the inner Jugular Vein) and not far from its Egress sends little Branches to the Muscles of the Neck and the Cowl-resembling Muscle. From hence in Man it associates to its self a Branch of the intercostal Nerve, and sends forth another remarkable Branch to the *Larynx*, which runs forward to the Throat and the exterior Muscles of the *Larynx*, and running under the Shield-resembling Muscle, proceeds to the point of the Turn-again Nerve, and is united to it. At this place where the Intercostal is joyn'd to it, and the other sent forth toward the *Larynx*, the stalk of the vagous Nerve is exalted into a long Tumor, and constitutes the Nervous Fold, call'd the Contorted Fold, and by *Fallopius*, *Corpus Olivare*; which Fold is also found in the Intercostal adjoyning, constituted by its concourse with the Nerve of the last Pair within the *Cranium*. Both these Folds are discover'd when the Carotid Arteries are laid open on both sides between the Muscles of the Neck; for then by tracking them, they are presently to be seen about the insertion of the lower Jaw. Besides this Fold, *Willis* has observ'd another lesser Fold, seated a little distance from it, which is form'd out of a small Twig of the foresaid Fold, wound about the Pneumonic Artery, and with the Branch descending from the Trunk of the right vagous Pair, as also with another Nerve design'd for the hinder Region of the Heart; and from this Fold he farther observes little Nerves to be sent to the right side of the fore-part of the Heart.

The Turn-again Nerves.

XXIX. *After it has form'd these Folds, the Trunk of the vagous Pair descending between the* Carotis *and the Jugular to the side of the Rough Artery, above the Throat is divided on both sides into the inward and outward Branch.*

Both the outward Branches presently after their separation provide for the Breast, proceeding from the Sternon and the Clavicle, and then there issue forth from it the *Nerves* call'd *Vocal*; because they constitute the Instrument of Speech, and the cutting off the one, renders a man half dumb, the cutting off of both renders him perfectly dumb. The said *Vocal Nerves* are also call'd the *Turn-again Nerves*? by the *Greeks* παλινδρομέντες, because they first descend and then ascend, the right being wound about the right *Subclavial* Artery, about the Trunk of the Great Artery, where it bows it self toward its Descent, that so they may run back to the Muscles of the *Larynx*, into whose Head, looking downwards, they enter with numerous Branches.

Now why the Nerves were not sent from above or out of the Neck into the Muscles of the *Larynx*, but are forc'd to turn upward again, *Galen* makes a long examination, but resolves nothing; but the true Reason is this; for that the Muscles of the *Larynx* cause the Voice and move the Air in measure as it goes out of the Lungs, therefore there is a necessity that their Head should be turn'd downward and their Tail upward. For to the end there may be a Modulation of the Air going out of the Lungs, the Supremities of the *Larynx* ought to be contracted from above toward the lower patts, to resist the egress of the Air at pleasure; yet not so as to be quite shut. Now in regard all the

the Muſcles draw the parts ſticking to their Tails, toward their Beginnings or Heads, therefore ought the Heads of the Muſcles of the *Larynx* be lowermoſt; and when the Nerves are to be inſerted in them, of neceſſity they muſt aſcend from the lower parts to theſe Heads; but if the Heads of theſe Muſcles were plac'd above, and the Nerves fix'd in them from above, then by the contraction of theſe Muſcles and expiration happening at the ſame time, an abſolute cloſure of the *Larynx* would follow, and conſequently ſuffocation of the Perſon. Now if any body ask me, why the Muſcles of the *Larynx* from the ſecond Pair rather run back, which may be brought from the next Nerves of the Spinal Pith? *Galen* anſwers them, that the Arteries and other parts which are to be more violently mov'd, require harder Nerves, as are thoſe which proceed from the Pith lying hid within the *Cranium*; but that to thoſe which are not ſo violently to be mov'd, ſofter Nerves are ſufficient; ſuch as are thoſe that proceed from the Pith without the *Cranium*, among which the ſixth pair is one, whoſe Turn-again Branches come to the Muſcles of the *Larynx*, which are to be gently mov'd.

The Turn-again Nerves being thus conſtituted, this pair deſcends by and by under the Throat, and at the bottom of the Heart toward the Spine, conſtitutes a certain Fold of Nerves, which ſome call the *Cardiac Fold*; from whence Branches are diſtributed to the *Pleura*, to the Tunicle of the Lungs, the *Pericranium*, the Heart, the Gullet and ſeveral other parts within the *Thorax*.

Fallopius making an exact Deſcription of this Fold, *This Nervous Fold*, ſays he, *derives its Original from the five Stocks of the Nerves, which although they are ſometimes only four, yet for the moſt part they are found to be five. The firſt of theſe is that which riſes from the ſiniſter Branch of the ſixth pair, a little below the Riſe of the Turn-again Nerves and afterwards reflecting to the ſiniſter Arterial Vein, aſcends into the ſaid Nervous Fold. The ſecond and third Stock is in the ſame left ſide, and riſes from that Fold which I have call'd the Fold of the ſixth pair in the Neck, ſeated near the* Olive Body. *From this Fold in the left ſide two little Nerves ariſe, which deſcending to the bottom of the Heart, are diſtributed through the ſaid Fold. The fourth Stock and ſiniſter too, is that which is ſaid by others to riſe from the Turn-again Nerve of that ſide; which deſcending with the third and ſecond, is diſpers'd into the ſaid Fold. The fifth and laſt Stock, ſeated in the right ſide, has a twofold beginning; from the right Fold of the ſixth pair, which runs directly to the Heart; and likewiſe from the* Cardiac Fold *it ſelf; but theſe Cardiac Branches from the intercoſtal Nerve, as alſo the Cervical Fold from which they proceed, are peculiar to Man, there being no ſuch thing in Beaſts.*

From theſe laſt Words it is apparent, that *Willis* deſcribes the Cardiac Fold ſomewhat after another manner than *Fallopius*; only the chiefeſt difference conſiſts in the diverſity of the Names of the Nerves.

The intercoſtal Fold.

XXX. *The Intercoſtal Trunk from the Cervical Fold, admits the Cervical Artery, and ſo deſcending into the Breaſt, admits three or four Branches from the Vertebral Nerves next above, and with them makes another remarkable Fold in Men; for it is otherwiſe in Beaſts. This Fold* Willis *calls the* Intercoſtal *and* Thoracic.

The Meſenteric Folds.

XXXI. *Moreover the Intercoſtal Trunk deſcending through the Cavity of the Breaſt, extends a Branch from it ſelf all along the lower and hollow part of both ſides; then three ſeparate Branches deſcend to the* Os Sacrum, *which being themſelves here and there united with other Nerves, and again ſeparated from them, make ſeveral other Meſenteric Folds*, which *Willis* reckons up to be ſeven in all. But leſt a too particular Deſcription of each of theſe ſhould breed Confuſion, we ſhall only inſiſt upon three of thoſe Branches. The firſt of theſe is carry'd to the Cawl, the bottom of the Stomach, the Tunicle of the Liver and Spleen, the Subſtance it ſelf of the Spleen and the *Colon-Gut*, which as it is thought, occaſions hoarſneſs after a tedious Cholic. The ſecond tends to the Spleen, which exagitating the Stomach by conſent, in Nephritic Pains, cauſes Vomiting. The third and largeſt proceeds to the Meſentery, the Guts, the Bladder and of the Womb.

Why the Bowels have their Nerves from the 6th. Pair.

XXXII. *Now why the Bowels receive their Nerves from the ſixth Pair, and not from the Vertebral Pith,*

Pith, Bauhinus *explains out of* Galen; *because that not having any voluntary motion, they do not require the harder Nerves proceeding from the Spinal Pith*; but left they should be altogether void of Sence and some slight Motion, and left they should be destitute of Animal Spirits necessary for Nourishment, they require only the softer Nerves, such as proceed from the Pith while it is yet in the Brain.

The 7th. Pair, moving the Tongue.

XXXIII. *The seventh Pair, moving the* Tongue, *much harder than the rest, arises with various Heads soon united in the hinder part of the Head from the Pith, ready to fall into the Spine, and through an oblique and proper Hole bor'd through in the hinder part of the Head, issues forth of the* Cranium, *and for Preservation sake, is ty'd to the sixth Pair with very strong Membranes, but not intermix'd; then again being separated, the greatest part of it goes to the Tongue, to all whose Muscles it imparts Branches for Motion; but the lesser portion of it proceeds to the Muscles of the* Hyois *and* Larynx, *and those which rise from the* Stytoides Appendix.

Whether these nervs differ from others in substance and composition.

Some think the Substance and Composition of the said Nerves within the Brain proceeding from the Pith, to be quite different from that of other Nerves, when ocular Inspection teaches us, that they consist in the same manner as other Nerves, of several strings bound together with a strong Membrane, and as it were united into one, and differ nothing from other Nerves, but only that they are softer.

CHAP. IX.

Of the order to be observ'd in shewing the Parts of the Brain in the foresaid Dissection, and of another manner of Dissection.

I. *According to the Method of dissection already mention'd, the thick and thin* Meninx *are first of all to be demonstrated, with the four Hollownesses of the hard Meninx, the division of the Brain, the Scythe or Falx interpos'd between; with the Fence continuous to it, which separates the Cerebel from the Brain; as also the Brawny Body that lies under it. Thence the upper parts of the Brain being taken away, the two upper Ventricles are to be shewn, the Lucid Fence, the Choroid Fold, the Channel of the Flegm to the Nostrils and the Fornix. Then the third Ventricle, and in that, the Choroid Fold, the middle Hole reaching to the Funnel, the pleighted little Hillocks, with the Hole of the Anus reaching to the fourth Ventricle, the Vein that runs through the Fold, discharging it self through the fourth Hollowness into the wide Hollowness; also the Pineal Kernal, the Buttocks and Stones. Afterwards the Cerebel with its Membranes and Processes, and that being taken away, the fourth Ventricle and the long Pith. Lastly, the Brain being rais'd up before, shews the Mamillary Process, the wonderful Net, the Spitly Kernel, the Funnel, with the pair of Nerves, proceeding from the Pith within the Skull.*

II. *If any one have a desire to observe another Method of Demonstration, it may be done after this manner; First, Shew the Meninxes above, the Division of the Brain, the Scythe, together with the Hollownesses, and the Brawny Body. Then the Brain being rais'd up before, shew the Mamillary Processes, the Optic Nerves, the Nerves that move the Eyes, the wonderful Net, and the Spitly Kernel. Then the Brain being rais'd up on the side, the other Pairs of the Nerves are to be shewn; and with the same labour, the Brain, together with the Cerebel and long Pith, is to be taken out of the Skull and turn'd. Then the remaining part of the Demonstration is to be compleated from the lower part. And first the Pith being rais'd up, the fourth Ventricle is to be shewn, and then the Cerebel with its Processes. After that, the wonderful Net with the*

the Funnel, and ſo diſſecting down to the Funnel, the third or middle Ventricle is to be ſhewn; where you are to ſearch for the furrow'd Hillocks, the Buttocks, the Stones, the Pineal Kernel, the Hole of the Anus, and the Fold of the Arteries; from hence you muſt proceed to the two upper Ventricles, where you muſt ſeek out the Choroid Fold, together with the Lucid Fence and the Channels conveying the Flegm and Spittle to the Papillary Proceſſes.

However, obſerve by the way, that this Method of Diſſection is perform'd with better ſucceſs in the Brains of Sheep and Calves than of Men, by reaſon of its extraordinary Bulk: For unleſs it be very new, all the Parts fall, by reaſon of their Flaccidity; ſo that nothing can be conveniently demonſtrated.

Another Method of diſſecting the Brain, but very laborious, the Invention of *Conſtantine Varolius*, which *Bauhinus* deſcribes, *l.* 3. *Theat. Anat. c.* 28. And another Method between both, of *Francis Silvius*, deſcrib'd by *Bartholine*, *l.* 3. *Anat. Reformat. c.* 6. to which I refer the Reader.

CHAP. X.

Of the Function of the Brain.

AFter Demonſtration of the Brain and all its Parts, it remains that we ſpeak in brief concerning the Office or Function, Actions and Uſe of ſo conſiderable a Bowel.

I. *From the Soundneſs of the Brain, it is confeſs'd by all, that the Soundneſs of all the Animal Actions proceed*; it being granted that thoſe Organs in the Body, by which thoſe Actions are to be perform'd, be well conſtituted; though let them be never ſo well diſpos'd, no Animal Action can be duly and rightly perform'd if the Brain be amiſs.

II. *Now becauſe the Animal Actions are or may be perform'd not only by the Brain alone, but alſo by the Rational Soul; hence many are perſwaded that the Seat of the Soul is to be aſſign'd to that Part from whence the Animal Actions proceed*; that is to ſay, the Brain in general, according to the *Arabians* and *Moſchio*, or, as others believe, ſome particular part of it. Thus *Hierophilus* ſeats it at the bottom; *Xenophon* in the top of the Head; *Eraſiſtratus* in the Membranes. From which Opinions however many of the Modern Philoſophers vary, who aſſign for its Seat the ſmalleſt Particle of the Brain in the third or middle Ventricle, that is to ſay, the Pineal Kernel; wherein they endeavour by many probable Arguments and Conjectures to prove the Reſidence of the Soul and the Actions of common Sence to be perform'd. This laſt Opinion much diſpleaſes others, and more eſpecially ſeems very hard to many Divines, who cannot apprehend, neither will ſuffer themſelves to be perſwaded, that ſo ſmall and narrow a Domicile ought to be thought ſufficient for an incorporeal Soul, infus'd by God, and governing all the Animal Actions of the whole Body, and yet be able to perceive all thoſe things which are done in the extream parts in the leaſt ſpace of a moment, even in the very point of time they are acted. Moreover, they do not believe the Seat of the Rational Soul to be ſo ſmall in Man; and yet in Brutes, which are deſtitute of that Soul, to be three times as big. Furthermore, they cannot apprehend why the Seat of the Soul ſhould not be aſcrib'd as well to the Heart, as to the Brain; ſeeing that all the Motions of the Animal Spirits and the Brain it ſelf proceed from the Heart; which when it ceaſes to beat, all the Animal Actions fail, as it happens in a *Syncope*, and in Wounds of the Ventricles of the Heart. Concerning this Matter, in our Age ſharp and furious have been the Conteſts on both ſides, as if they were contending for the ſafety of their Country, and daily moſt terrible Paper-Diſputes ariſe, eager indeed and vehement, but vain and frivolous; by which the Minds of young People are more diſturb'd than taught. But ſetting aſide theſe unprofitable Conteſts, let us enquire into the more ſenſible Action of the Brain it ſelf.

The Office of the Brain.

III. *Ariſtotle* teaches us, that the Office of the Brain is to temper the heat of the Heart. Which Opinion, though moſt reject, *Spigelius* nevertheleſs endeavors to aſſert it for Rational. *Galen* attributes to the Brain the Office of generating and making Animal Spirits. With whom moſt of the Modern Philoſophers

phers agree: For this is moſt certain, that the Animal Actions are not at the firſt hand perform'd by the Brain it ſelf, but by the Animal Spirits made in the Brain, by means of which the Soul in well diſpos'd Organs executes its Actions, and ſo the Brain is the Inſtrument which generates thoſe Spirits.

Theſe Spirits *Zabarel*, *Argenterius*, *Helmont*, *Deuſingius* and ſome others, as well Phyſitians as Philoſophers, confound with the vital Spirits; and affirm that they differ from them not in *Specie*, but only in certain Accidents; and therefore it is that *Spigelius* ſays, Not that there is here a certain mutation of the vital Spirits, which deſtroys their whole nature, but only a certain alteration of the Temperament. *Ent* agrees with *Spigelius*, and ſupports his Opinion with theſe three Arguments.

1. The Birth both feels and is mov'd in the Womb without the aid of any Animal Spirit, in regard that no Maternal Nerve runs to the Birth.

2. A moſt ſubtil Spirit cannot be made in a cold Brain and full of mucous Filth; for Cold ſtupifies the Spirits, and hinders their Actions.

3. The Nerves themſelves derive their Life and Heat from the Arteries, which are conſpicuouſly diffus'd through them.

To theſe Arguments others add one more; that the moſt ſubtil Spirits never deſcend to the lower parts; but always tend upwards and exhale; and hence although there ſhould be allow'd any Animal Spirits to be ſo ſubtil, they would never deſcend into the Nerves, but would always fly upwards through the Pores.

But though theſe things ſeem ſpecious enough at a diſtance, yet they neither prove nor confirm the ſaid Sentence.

To the *Firſt* I anſwer, That the Birth in the Womb is neither mov'd with an Animal Motion, nor feels, until the firſt delineaments of the Brains and Nerves are arriv'd and increas'd to ſuch a Bulk, Firmneſs and Perfection, that the Brain may be able to generate Animal Spirits ſufficient, and that thoſe Spirits may be conveniently convey'd to the ſenſitive and moving parts, and becauſe it requires ſome Months to attain that perfection, therefore the Birth does not move it ſelf, until the Woman have gone out half her time; that is, about the fourth Month and a half. For what Spirits are generated before that time, are very few and weak; and the reſt of the Parts themſelves of the Body unapt for Motion or Sence. Nor does the Motion of the Birth proceed, nor is it perform'd by the Spirits or Maternal Nerves running to it; of which there are none that enter the Birth, but by the Spirits and Nerves generated in it ſelf.

To the *Second*, I ſay, that there is no conſiderable Magnitude requir'd for the making of Animal Spirits, but rather a Mediocrity of Heat, ſuch as is ſufficient in the Brain, though it be much leſs than in the other parts. And there is a neceſſity for that leſſer Heat, which they call Cold, to aſſwage the Heat of the Arterious Blood, and in ſome meaſure to thicken its Volatile ſulphurous Spirits, that ſo the Animal Spirit may ſeparate it ſelf more pure from the ſalt Particles, and may flow into the Nerves, no longer beſet with ſuperfluity of viſcous Vapors. Moreover, it is to be underſtood that although the Brain be ſaid to be colder than other parts, yet that it is not abſolutely cold, only that the Temper of it is leſs hot than of many other parts; and that the proper confirmation of it is ſuch as is moſt fit for the generation of Spirits. Laſtly, the natural Temper of the Brain inclining to Cold, is not ſuch as ſtupifies the Spirits, nor renders them unapt to perform their Actions in the Parts; but its preternatural cold Temper excluding the Blood and natural Heat by a too cloſe conſtriction of the Pores, is the cauſe that for want of convenient Matter, few Spirits are generated therein, and that thoſe already generated with great difficulty, and in ſmall quantity flow through the ſtreightned Pores and Nerves. Which is the Reaſon that then the Actions fail by degrees; not becauſe the Actions are ſtupify'd, as is vulgarly believ'd; but becauſe very few are generated & flow into the parts. For the Spirits endure no Stupefaction; for Drowſineſs is nothing elſe but a reſt of the Actions in the Senſory Organs, by reaſon of the ſcarcity of the Animal Spirits. To the *Third*, I anſwer, that although the Brain and Nerves are nouriſh'd with Arterious Blood, it does not thence follow, that the Animal Spirits generated in the Brain, are nothing different from the Blood and Vital Spirits generated in the Heart, and carry'd through the Arteries, for the nouriſhment of the Parts. for this is as much as if a man ſhould ſay, The Stomach is nouriſh'd by the Arterious Blood generated out of the *Chylus*, therefore the *Chylus* concocted

therein, is nothing different from the Blood. Or thus, The Heart changes the *Chylus* into Blood, therefore the Blood which is generated therein, is nothing different from the *Chylus*. Or thus; The Bread is turn'd into *Chylus*, and the *Chylus* into Blood; therefore the bread differs nothing either from the *Chylus* or the Blood.

To the *Laſt* I ſay, That the Animal Spirits would eaſily exhale out of the Brain and Pith, unleſs they were there with-held in their cool Work-houſe, which hinders their ſudden Exhalation, and would flow into the Nerves which are of a firmer Subſtance; and thus all Chymical Spirits are beſt kept cloſe in cool Veſſels and hinder'd from exhaling. Moreover, that they would not deſcend into the Nerves, unleſs being ſqueez'd out of the Brain and Pith by the alternate dilatation and falling of the Brain, the hinder parts preſſing the fore-parts, as one Wave drives forward another, is apparent from hence, for that the motion of the Brain ceaſing through a *Syncope*, or depreſſion of the *Cranium*, &c. no more Spirits flow into the Nerves, but all the parts fall without Motion. Thus in an Organ we ſee that the thin Air, which would never of it ſelf deſcend violently downward into the Pipes, by the falling of the dilated Bellows, is eaſily forc'd into them. Upon this Subject read more in *Sennertus's Inſtitutes*, *l.* 1. *c.* 6. and his *Prax. Med. p.* 2. *c.* 33. where he refutes and deſtroys the foreſaid Argument with moſt convincing Reaſons.

This Opinion therefore being altogether rejected, we muſt hold it for certain and unqueſtionable, with the conſent of the greater part of the Philoſophers, that there are Animal Spirits, bred indeed out of the Vital, but actually very much differing from them, as the Bread differs from the *Chylus*, the *Chylus* from the Blood, and the Blood from the Subſtance of the Parts; for as the *Chylus*, coming into the heart, loſes its firſt Conſtitution, and aſſumes a quite different, which has nothing of ſimilitude with the former, and ſo is turn'd into Blood; ſo the moſt ſubtil part of the Vital Blood aſſumes in the Brain a new and altogether different *Species*, together with a new and altogether different ſtrength and efficacy. Here, if any one will object, that the ſame Spirits were before in the Blood, ſo far as they are afterwards produc'd out of the Blood, and cannot be produc'd out of the Blood unleſs they were in it before; I will not contend with him, if he mean that the Matter of theſe Spirits was in it before. For thoſe Animal Spirits, ſuch as they are made in the Brain, are not actually contain'd in the blood; but the Matter out of which they are to be made is contain'd therein. In the ſame manner the ſpirituous Blood is not contain'd in the Meat and Nouriſhment; but the Matter out of which ſuch Blood is generated by the concoctions of the Bowels. Or as the Herb or the Tree is not contain'd in the Earth, but the Matter out of which the Herb or the Tree is to ſpring and be rais'd up by the heat of the Sun. Or, as the Veſſel is not contain'd in the Clay, but the Matter out of which the Veſſel is to be made; which is ſo different from the Veſſel, that a Child would account him a Fool that ſhould call the formleſs Clay a Veſſel.

The Action of the Brain.

IV. *But now 'tis the unanimous Opinion of all Phyſicians, that it is the proper Office of the Brain to generate the Animal Spirits; and that thoſe Spirits flow through the Nerves out of that Work-Houſe wherein they are generated into the Parts, and may be ſent forth every way in greater plenty by the Soul, with a certain determination, as Aſſiſtants and Conveyers of the Powers which ſhe diffuſes from her ſelf.* But in what part of the Brain theſe Spirits are generated, is greatly diſputed; and what they are, is altogether unknown; and therefore they both require a larger Diſcourſe.

Whether generated in the Cavities of the Falx.

V. Peter Laurembergius *believ'd theſe Animal Spirits to be generated in the Hollowneſſes of the* Falx. From whoſe Opinion *Daniel Sennertus* does not differ much. But this Opinion proceeds from their not knowing the Uſe of the *Sinus's* or Hollowneſſes of the *Falx*, and therefore they are eaſily refuted by what we have already ſaid concerning thoſe Hollowneſſes, *c.* 4.

Andreas Laurentius, *Riolanus*, *Lud. Mercator* and many others, with whom *Regius* alſo conſents, believe theſe Spirits to be generated in the Cavities of the Ventricles, out of the hotteſt Arterious Blood exhaling from the Choroidal Fold (with which ſome think the Air to be intermix'd by inſpiration) and that they are forc'd out of theſe Ventricles through inviſible Pores into the Nerves, and ſo through them flow to the reſt of the Parts. Some, according

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to the Opinion of the *Arabians*, affirm, that they are generated not in all the Ventricles, but only in the fourth Ventricle; which for that reaſon, they call the moſt principal. Both theſe Opinions *Galen* alſo profeſs'd, as alſo *Hippocrates* and *Plato*. But both Reaſon and Experience evince this Opinion concerning the Cavity of the Ventricles. For if the Vital Spirits ſhould exhale out of the *Choroidal* Fold into the Cavities of the Ventricles, there to be turn'd into Animal Spirits, I would fain know, how the Animal Spirits already generated out of thoſe Vital Spirits ſhall enter into the Nerves, which have no continuity with the Ventricles? Shall the Vital Spirits, which exhal'd out of the Fold, being become Animal again, breath into the Nerves which lie at a diſtance from the Nerves? Or can the Soul diſpoſe at pleaſure of the Spirits generated and contain'd here and there beyond the Bounds of its Juriſdiction, that is to ſay, in the Ventricles? Beſides, if the place be conſider'd, it will be found no way proper for the generation of the Animal Spirits. For in the Ventricles are gather'd together ſnotty Excrements, which are found therein, ſometimes in greater, ſometimes in leſſer quantity, as well in thoſe that are ſound, as thoſe that are ſickly. Thus it would come to paſs, that theſe thin and moſt impure Spirits would be generated without the Veſſels in the Cavities of theſe Ventricles, among the moſt impure and cold Excrements of the Brain, and thence, notwithſtanding their being thicken'd by the cold Excrements, muſt flow out again together with the thicker Excrements through moſt narrow and almoſt inviſible Pores, rather into the Nerves far enough ſeated from the Ventricles, then through the broad and open Channels of the Papillary Proceſſes and the Sieve-like Bone; which how abſurd it is, there's no body but may eaſily perceive. Beſides, in the watery Diſeaſe of the Head, call'd *Hydrocephalus*, in which many times there is a great quantity of ſerous Humour collected in the Ventricles, ſometimes ſeveral pounds; as alſo in an Apoſtem of the Brain, at what time the purulent Matter is pour'd forth into theſe Veſſels, I ſay in theſe caſes, neither could theſe Spirits be generated, nor the Animal Actions proceed; of which the contrary is manifeſt from Experience: For in a Patient that I diſſected in *March* 1653. whoſe diſtended Ventricles containd above half a pound of thick ſtinking green *Pus*, from the large Apoſtem of the upper part of the Brain, penetrating as far as the upper Ventricles, I obſerv'd that all the time of his Sickneſs for ſeven Weeks together, he was no way diſturb'd in his Intellects, nor depriv'd of Motion till the time of his Death. Beſides, that if they did not flow through the already mention'd Veſſels evacuating the Flegm, yet would thoſe Spirits fly out at the Wounds of the Ventricles, and for want of them the Perſon would be depriv'd of all Animal Action. Yet *Galen* tells us a Story of a young Man, who at *Smyrna* in *Ionia*, receiv'd a Wound in one of the upper Ventricles, yet liv'd for all that. I my ſelf here in *Utrecht*, in the Year 1648. inſpected the Body of a young Nobleman of *Over-Yſſel*, a Student in the Law, who dy'd of a wound in his Head, in whom the *Cranium* being firſt open'd, it was firſt found that the Sword had enter'd the bigger or innermoſt Corner of one Eye, without any harm to the Eye it ſelf, and had penetrated through the upper right Ventricle, and lighting upon the upper part of the *Cranium* on the inſide toward the top of the Lambdoidal Suture, had almoſt pierced that alſo; yet this young Gentleman was depriv'd of none of his Animal Actions (a certain Sign that the Spirits had not flow'd out of the Ventricle through the broad Wound) but ſound in Mind, Seeing, Hearing, Taſting, and well moving all his Parts, walking and judiciouſly diſcourſing with his Companions that came to ſee him, upon any Diſcourſe, liv'd ten days, and then being ſeiz'd with a violent Fever, dy'd in two days. Thus *Lindan* makes mention of a certain Patient that was wounded, whoſe Surgeon for fourteen days together before his Death, put in a Probe as far as the Ventricle of his Brain, whither the Wound had reach'd, without any feeling. Yet he further adds, that the ſame Perſon walk'd every day about the City, unleſs it were the laſt four days, at the end of which he dy'd. In theſe Caſes, certainly the moſt ſubtle Spirits had either flow'd out of their own accord, or had been expell'd out of the Ventricles by the alternate dilatation and compreſſion of the Brain, and ſo the perſon muſt have dy'd depriv'd of his Animal Actions, if the place of their Generation had been in the Ventricles. From all which Examples the weak Supports of the ſaid Opinion are ſufficiently evident; though *Webſer* re-

futes the same Opinion more clearly by other Reasons, *l. de Apoplexia.*

Whether generated in the Pineal Kernel.

VI. Carteſius *differs not very much from the ſaid Opinion, who teaches us, that theſe Spirits are not generated in the Ventricles, but ſays, that they are ſeparated in the Pineal Kernel, by the narrow Paſſages of the little Arteries of the Choroid Fold, and from thence infus'd into the Ventricles, and no other way differ from the Vital Spirits, only that they are the thineſt Parts ſeparated from them, and only call'd by another Name.* To which he adds, that there is no probability that the ſeparation of theſe Spirits is perform'd in the Pineal Kernel, as well by reaſon of the ſmalneſs of the Kernel, as the vaſt quantity of Animal Spirits, which can never be ſo ſwiftly ſtrain'd through ſo diminutive a particle. Beſides that this Kernel being obſtructed and compreſs'd, yet it is found that theſe Spirits are generated in great quantity; as was apparent in the forecited perſons, in whoſe Ventricles the *Pus* and *Serum* that was collected in great quantity, could not but compreſs the Kernel and obſtruct it in its Office; as is alſo apparent in ſuch Men in whom you ſhall find Sand and Stones oppreſſing more than half the Kernel. As to that which follows, where *Carteſius* ſays, that theſe Spirits are collected in the Ventricles, that is already refuted; as alſo that other, that they differ nothing from the Vital Spirits, but only in their ſeparation.

Whether generated in the Choroid Fold.

VII. *Many others believe, that the Animal Spirits are elaborated in the* Choroid *Fold, and that the Vital Blood in its paſſage through the Fold, is alter'd into theſe Spirits by a ſingular propriety of the Brain.* Which Opinion, as the Liver, many embrace at this day, and I was of the ſame mind once, though now I have good reaſon to think the contrary. For upon more mature conſideration, three Arguments utterly ſubvert it.

Firſt, Becauſe the Blood contain'd in that Fold, is altogether ruddy, neither is it obſerv'd to undergo any alteration therein, neither at any time, whatever part of the Fold you inſpect, is it of any other colour than red and Blood-colour; whereas the Animal Spirits are pellucid and inviſible by reaſon of their extraordinary ſubtility.

Secondly, Becauſe the Fold is not continuous with any of the Nerves, and therefore no Spirits can be transfus'd out of it into the Nerves.

3ly. Becauſe the Blood flows into the Pithy Subſtance of the Brain out of the Fold, partly through innumerable diminutive branches, partly by the order of circulation, flows to the Vein that runs between the middle Fold above the Kernel, and thence is carry'd to the inferior Hollowneſſes of the hard *Meninx* or Scythe, and from them to the Jugular Veins. Through which Paſſages the Animal Spirits alſo, if any were made in the Fold, would flow forth together with the Blood, nor would any reach to the Nerves which are ſeated without the Fold, and no way continuous to them.

Whether generated in the exterior Arteries.

VIII. Francis de le Boe Sylvius *ſuſpects them to be elaborated in the Arteries running forth all along the Superficies of the Brain and Cerebel, which he thinks to be diſtributed thro' the Superficies for that public, and not for any private Uſe, and that out of thoſe Arteries they penetrate into the Cortex of the Brain and Cerebel, and thence into the middle whitiſh Subſtance, and in this Paſſage are freed from its watery part that ſticks moſt cloſely to it.*

But this Opinion is overthrown by theſe three Arguments.

1. Becauſe that in the Arteries of the Head there is no other Humour contain'd than in other Arteries, that is to ſay, Blood; and thoſe Arteries are only aſſiſting Parts conveying the Blood, not altering it into Animal Spirits, or making any other Humor or Spirit out of it.

2. Becauſe the innumerable bloody Specks which every way occur to the Sight in the diſſected Subſtance, teach us, that not the Animal Spirits, but the arterious blood it ſelf is thruſt forward as well through the Aſh-colour'd *Cortex* of the Brain, as through the whitiſh Subſtance out of the Arteries; which bloody Specks would not appear, if that blood were only chang'd into inviſible Animal Spirits in the ſaid Arteries.

3. Becauſe the ſeveral remarkable Mutations of Humors require ſome particular Bowel to make that alteration; as appears in the Stomach, which turns the Nouriſhment into *Chylus*; in the

the Heart, which changes the *Chylus* into Blood; in the Liver, which alters the blood into a choleric Ferment, and therefore we muſt certainly conclude, that the making of Animal Spirits out of Blood cannot be perform'd in the Arteries, which only carry the Matter out of which they are to be generated; but that of neceſſity it muſt be perform-ed in that moſt noble Bowel the Brain, and not in the Arteries encompaſſing the Brain and Cerebel, but in the Sub-ſtance it ſelf.

Whether generated in the Sub-ſtance it ſelf of the Brain.

IX. *Thus alſo* Galen, *and with him* Bauhinus *and* Sennertus, Hoff-man, Emilius, Pariſanus *&* Plempius *believe them to be elaborated in the Subſtance it ſelf of the Brain.* Whoſe Opinion we are alſo willing to embrace, as being that of which the Truth ap-pears from hence, becauſe the arteri-ous blood is driven from all Parts in greater quantity to the Subſtance of the brain, than is requiſite for the nouriſh-ment of it. For on the outſide Thou-ſands of little branches of Arteries emp-ty a great quantity of blood, partly in-to the Aſh-colour'd *Cortex* enfolding the brain, in whoſe little Kernels apt Particles are ſeparated for the Genera-tion of Spirits from thoſe that are unapt, and ſuckt up by the extre-mities of the little Fibers of the brain extended into the *Cortex*, partly enter the Subſtance of the brain it ſelf. More-over, on the inſide alſo in the third Ventricle that there are infinite ſlender branches inſerted from the Choroid Fold, into the white Pithy Subſtance, and which ſtick and cling to it, will ea-ſily appear to thoſe who have prudent-ly examin'd that Ventricle, and gent-ly lifted up the *Fornix* or Arch; for then they may perceive innumerable little branches of the Choroid Fold ſticking to, and entring the Subſtance of the *Fornix*, the furrow'd Monticles, the Stones and Buttocks, and pouring into the Pores of it the thinner blood freed by the little Kernels of the Fold from a great part of its viſcous *Serum*, which in the diſſection of the Subſtance is ſeen to ſtart as well out of the invi-ſible Veſſels as out of the Pores. More-over, it is requiſite that the Animal Spirits ſhould be generated in that part out of which they may moſt convenient-ly either flow or be thruſt forward into the Nerves. But ſuch a part is the Sub-ſtance of the brain and pith, which as being altogether fibrous and continuous with the Nerves, has alſo Pory Fibers continuous with them, into which, by the compreſſion of the brain, which follows its dilatation, thoſe Spirits may commodiouſly be ſqueez'd forward. Laſtly, the Soul makes uſe of the Mi-niſtry of theſe Spirits, and therefore they ought to be generated and con-tain'd in that part where the Soul re-ſides. But the Soul does not reſide in empty Cavities or Ventricles in the midſt of excrementitious Filth, but in ſolid living Parts. Therefore as it re-ſides in the Subſtance of other Parts, ſo likewiſe in that of the brain, where it lays the foundations of the Animal Spi-rits, which from thence it ſends every way at her own pleaſure through the Nerves.

Two Objections.

X. *This Opinion two great Diffi-culties ſeem to oppoſe.*

1. *Becauſe the Apoplexy, and other heavy Drowſineſſes proceed, ac-cording to the Judgment of moſt emi-nent Phyſicians from a ſtoppage of the Animal Spirits, which hinders their Influx out of the Ventricles of the Brain into the Pith, by reaſon of ſome obſtruction of the beginning of the Pith, or its compreſſion happening through ſome other Cauſe. Which Obſtruction or Compreſſion would not be the Cauſe of the Apoplexy or that ſame Lethargic Drowſineſs, if the Spirits were not generated in the Ven-tricles or the Choroid Fold, but in the Subſtance of the Brain it ſelf.*

2. *Becauſe the Diſpoſal of the Spi-rits determinated by the Mind, would not be compleated in the Subſtance of the Brain it ſelf, but in the common Senſory, which is ſeated in the Brain it ſelf.* This the *Catalepſis* plainly ſhews us, wherein the Spirits flow in great quantity into the Nerves, but no new determination of them follows, becauſe of the Obſtruction of the com-mon Senſory.

The Cauſe of the Motion of the Brain.

XI. *The firſt Difficulty is eaſily remov'd, if the Cauſe of the Motion of the Brain be more narrowly pry'd into. In the Fifth Chapter we have at large inform'd you, that the Brain is mov'd by the perpetual & firſt Mo-ver of our Body, that is to ſay, the Heart; and that the Heart dilates the whole Brain by forcing through the Arteries the Spiritnous Blood into*

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its Substance, which upon the cessation of that Impulse, presently falls again, and so by compression forces the Spirits contain'd in it further into the Nerves.

The Reason of the Apoplexy.

XII. *Now, if through any Cause, as Obstruction or Compression,* &c. *the Arteries happen to be streighten'd, through which the Blood is push'd forward and flows into the Brain, by which means the free access of the Blood forc'd through the Arteries to the Brain, is foreslow'd or obstructed, then there is a great diminution of the Matter proper for the generation of Spirits, and the motion of the Brain is very small; whence happens not only a generation of very few Spirits, and a weaker Impulse of them into the Nerves. Now in regard that few Spirits, and those weakly impuls'd, are not sufficient to perform the Actions of the Sensory Organs, whose Actions are also perform'd by the continual and sufficing motion of the Spirits, of necessity there follows a deep Drowsiness or Rest of the Animal Actions, which Drowsiness is either more or less, as the streightness of the Arteries is either more or less. But if those Arteries through which the Blood flows toward the inner parts of the Brain, that is to say, the Arteries of the wonderful Net and the Choroid Fold, nay, the Carotid Arteries themselves be of a sudden strongly compress'd and obstructed by the sudden falling of thick Flegm collected in the Brain, upon them, or the depression of the Skull and Brain, presently the Motion of the Blood toward the Brain is obstructed; and hence also the generation of the Animal Spirits, and their motion and impulse into and through the Nerves is obstructed, which is the Cause of the Apoplexy.* Which Physicians hitherto have absurdly affirm'd to happen from the obstruction or streightning of the beginning of the Nerves, when it altogether proceeds from the obstruction or compression of the Arteries. Which *Hippocrates* most clearly teaches us, where he asserts the Cause of the Apoplexy to be the standing of the Blood, more especially in the Arteries of the Neck, that is to say, the *Carotides*, and others deriv'd from thence, such as those which compose the wonderful Net and Choroid Fold: Seeing that thereby the Motion and Action of the Spirits is destroy'd; which Motion being obstructed, the body must of necessity rest. Let us hear the most acute *Fernelius*, who confirms this Matter most elegantly by Experiments and Reasons.

Seeing upon a time, says he, *a lusty sane man fall to the ground upon a desperate Blow upon the Left Eye, and presently depriv'd of Sence and Motion, together with a difficulty of Breathing and Snoaring, and other strong Symptoms of an Apoplexy, and that he could neither be preserv'd by Blood-letting, nor any other way, but that he dy'd within twelve hours, I thought it worth my while to search into the Cause of his Death. To that purpose, having dissected and open'd his Brain, and finding no Contusion of the Bone or Meninxes, or Substance of the Brain, but only that the inner Veins of the Eye were broken by the violence of the Contusion, I observ'd that from thence about two Spoonfuls of Blood had lighted upon the Basis of the Brain, which being clotted together, had bound up those Arteries which form the Net-like Contexture, and which being thence propagated into the Ventricles of the Brain constitute the other Choroid Fold. But the Ventricles of the Brain were altogether untouch'd without any Damage. Being thus far satisfy'd, I thought good to dissect another, who dy'd without any external Cause to be seen; in whom there was found a thick and viscous Humor resting upon the Net like contexture, the Ventricles of the Brain being neither fill'd nor obstructed. Hence reasoning with my Self, I judg'd it consentaneous to Reason, that the Apoplexy was generated in the Arteries either obstructed or compress'd; for that then the Brain receiv'd no Spirits from the Heart, through the adjoyning Arteries; which occasion'd an absolute necessity of its Motion and Sence. And a certain Person observing these things, as I suppose, affirm'd, that the Apoplexy was caus'd by the intercepting the Passages that are common to the Heart and Brain.*

Thus if the Cause of the Disease of all Apoplectics were more diligently enquir'd into, it would be found to proceed not from the compression or obstruction of the beginning of the Nerves in the third or middle Ventricle, but solely from the compression or streightning of the Arteries tending to the Brain; even then when the Apoplexy

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is caus'd by a rammaſſment of ſerous Matter collected in the ſubſtance of the Brain it ſelf, or between the *Meninxes*. Which *Webſer* affirms that he has found to be true by experience upon ſeveral Diſſections. Who erroneous however, conjectures this to happen by reaſon of the deny'd entrance of the Animal Spirits, when it is manifeſt that the ſtoppage of the Arteries is the cauſe of it; for ſeeing that in an Apoſteme of the Brain the Orifices of the nerves are not clos'd by the quantity of *Serum* or *Pus* collected in the ventricles, much leſs will it happen through any far ſlighter Collection. Again, that it does not happen through any Flegm that fills the Veſſels of a ſudden, occular view teaches us in the Diſſections of Apoplectics; in whoſe Ventricles never ſo great a quantity of Flegm is to be found in the Ventricles; and moreover, becauſe the Apoplexy is caus'd by the ſole compreſſion of the little Arteries of the wonderful Net without any detriment to the Brain, much leſs to the Ventricles, as appears by the foreſaid Relations of *Fernelius*, and the Story of *Webſer*, of the Woman that was hang'd, and yet came again to her ſelf. In which Particular *Martian* alſo agrees with us.

I find, ſays he, *three Differences of the Apoplexy, according to the Doctrine of* Hippocrates. *Of which though there be various preceding Cauſes, yet in reality they are all the ſame, as conſiſting in the ſtanding of the Blood, by which means all Motion and Action of the Spirits are taken away. For as the ſame Author obſerves, when the Blood is not mov'd, it is impoſſible but that the Motion of the Body muſt ceaſe. Therefore when the Blood is depriv'd of Motion, not only the Motion of the Spirits is intercepted, which is caus'd by the Blood; but at the ſame time and together, the generation of the Animal Spirits, which is perform'd in the Brain, is vitiated and interrupted for want of Matter, the Veins or Arteries being intercepted; for it is well known that the Animal Spirits are generated out of the Vital.*

As to that Cauſe of the Apoplexy, which *Malpigius* and *Fracaſſatus* propound, when they alledge this Diſtemper to proceed from the ſtoppage of the ſtraining through of the *Serum* growing in the *Cortex* of the Brain; this Opinion, if rightly explain'd, will agree with the former already laid down: For if the concreſcible *Serum*, as they call it, that is to ſay, if the Saltiſh Particles of the Blood, being ſtopp'd in the *Cortex* of the Brain, through the depreſſion of the *Cranium*, ſtuffing up of Flegm, or any other Cauſe, cannot be ſeparated by ſtraining through, then alſo is the ingreſs of the Vital Spirits or Arterious blood into the brain, put to a ſtop; and thence for want of Matter for generation of the Spirits, and defect of the Cauſe that puſhes them forward when generated, any farther Generation ceaſes, as alſo the puſhing forward of the Animal Spirits into the Nerves, and thence the Apoplexy or any other Lethargic Drowſineſs, though the Paſſage of the ſame Spirits out of the brain it ſelf into the Nerves, may be free at the ſame time.

XIII. *As to the ſecond Difficulty, there is a great difference between the Generation of Animal Spirits, of which we here diſcourſe, and their Determination; and the Place wherein or from whence the Determination is made.* For becauſe the Mind determines from the common Senſory, the Spirits adhering to the Subſtance of the brain, this does not hinder but that thoſe Spirits may be generated in the Subſtance of the brain, and thence be determin'd by the ſuperior Command and Power of the Mind to theſe or thoſe Parts: Nor is it conſequential from hence, that the Spirits ſhould be generated in that place from whence the Determination of the Mind ſends them away at pleaſure. A Prince, ſitting in his Throne, appoints his Subjects to theſe or theſe Offices or Places; but thence it does not follow, that the commanded Subjects ſhould be born in the King's Palace, or reſide in his Throne; for that the Beams of his Command extend themſelves to the utmoſt Limits of his Empire. *The ſecond Objection anſwered.*

He therefore that ſhall to the purpoſe explain the manner how the Appointment of the Spirits is tranſacted by the Soul, will light a fair Flambeau for the diſcovery of greater Myſteries. In the mean while this ſecond Objection makes nothing againſt our Opinion; and therefore as moſt probable, we conclude, that the Animal Spirits are generated in the Subſtance of the brain it ſelf.

CHAP.

CHAP. XI.

Of the Animal Spirits.

IN the foregoing Chapter it has been declar'd, that the Office or Action of the Brain is to generate Animal Spirits; and that they are elaborated in the Substance of the Brain it self: now it remains that we enquire of what sort and what those Noble Spirits are; and how they are generated.

However, by the way observe, that when we discourse of Spirits, as here, and *l.* 2. *c.* 12. we do not speak of certain incorporeal Spirits, or of the general Spirit of the whole World, by which the *Platonics* alledge that all things have their Being, but of a certain most subtil Vapour which is produc'd out of Sulphur and Salt by the Concoctions of the Bowels, and varies, according to the variety of the Matter out of which it is extracted, and the various manner of extraction, which endow it with different Qualities.

The Definition of Spirits.

I. *The Animal Spirits are invisible Vapours, most thin and volatile, chiefly elaborated out of the Salt Particles of the Blood, and some few Sulphury, chiefly volatile, and that in the Brain, serving partly for the Natural, partly for the Animal Actions.*

As for those that deny that any Animal Spirits are to be allow'd specifically different from the Vital, as *Huffman*, *Deusingius* and several others endeavour to uphold, we think it an Opinion not worth refuting, and therefore to be rejected; seeing that the one is compounded of Salt and many Sulphury Spirits dilated together and exactly mix'd in the Heart: the other consists of very few Sulphury, but chiefly Salt Spirits, and differ not in respect of their Substance only and Composition, but also in their Use; and are made in a peculiar bowel, the brain, every way different from the Heart. Lastly, seeing also that from them the Animal Actions proceed, very much different from the Natural; as the Phansie, the Imagination, Ratiocination, the Memory, Judgment, Feeling, Seeing, Motion of the Muscles, *&c.* and that from their being vitiated, peculiar Affections and Diseases arise; as is apparent in *Vertigo's*, Apoplexies, Nightmares, Madness, Phrensie, Convulsions, and other Accidents proceeding from their deprav'd Motion, too copious influx or deficiency; the like to which cannot proceed from the defects of the Animal Spirits. All which is clearly made out by *Galen*, *l. de Placit. Hipp. & Plat. c.* 6. as also *l.* 7. *c.* 3. *de usu Partium.*

The Opinion of Glisson concerning the Matter.

As to the Matter out of which these Spirits are generated, Glisson *and* Charlton *have endeavour'd to introduce lately something of Novelty; who both maintain these Spirits to be generated of some portion of the* Chylus, *which is suck'd up by the Nerves, out of which partly these Spirits produc'd, partly some Juice, rawer than the Blood is generated, which flows through the Nerves to the nourishment of all the Spermatic Parts.* But this absurd Opinion we have already refuted, *l.* 1. *c.* 16. And *Deusingius* also destroys it in a large Discourse, *l. de Nutritii Succi novo Comment.* The most ancient and truest Opinion is, that they are generated out of the arterious blood; but after what manner they are generated, has never hitherto been certainly describ'd.

The Opinion of Cartesius.

Cartesius, *with whom most at this day agree, discourses thus concerning this Matter. It is to be consider'd,* says he, *that all the more vivacious and subtil parts of the Blood, which the heat rarifies in the Heart, immediately and in great quantity enter the Cavities; and therefore they rather muster thither than to any other part, because that all the Blood which goes out of the Blood through the great Artery, directs its course in a direct Line to that part; and when it cannot all enter, because the Passages are very narrow, the more agitated and subtil parts of it pass through alone, while the rest diffuse themselves through all the parts of the Body. Now these most subtil parts of the Blood compound the Animal Spirits; neither do they to that end want any other alteration in the Brain, only that there they are separated from the other less subtil parts of the Blood. For those which I call here Spirits are nothing but Bodies, and have no other Propriety, only that they are most subtil Bodies, and are moved with an extraordinary celerity,*

By

By these Words it appears, that *Cartesius* did not differ much from the Opinion of those who believe the Animal Spirits nothing distinct in *Specie* from the Vital, which is already refuted. And this he openly seems to signifie, *l.* 2. *de hom. Artic.* 10. Where he speaks thus; *That portion of Blood*, says he, *which rises up as high as the Brain, not only helps the nourishment and preservation of the Substance of the Brain, but also in the first place generates therein a subtil Vapour, or rather active and pure Flame, which we call the Animal Spirits.* A little after he adds. *And thus the more subtil Particles of the Arterious Blood, without any preparation or mutation, other than that by which they are separated from the thicker Particles, and are agitated with that vehement celerity which the heat of the Heart has endu'd them with, lose the form of Blood, and come under the name of Animal Spirits.*

Moreover, he asserts a certain wonderful Separation of the thinner parts of the Blood from the thicker, whereas the arterious Blood, altogether such as it is, is equally thrust forward through the Arteries upward and downward, neither is there any reason why the more subtil parts should be more specially carry'd upward toward the Head, and the thicker flow to the rest of the Body. As to the narrowness of the passages, that proves nothing; for the Carotid and Cervical Arteries are wide and large enough; so that the thicker blood mix'd together with the more spirituous, may as well flow through them as the other Arteries. Neither does the directness of the passage to such a separation of the most subtil particles from the thicker, make any thing to the purpose; for the blood being violently thrust forward out of the Heart, rushes forth where it finds way given, without any separation of the particles. For the Spirits are not separated from it by degrees, as the Spirits of Wine or any other Liquor containing Spirits, in a Chymical Distillation, where by the force of the Fire the Spirits are dissolv'd by degrees without any other impetuous compulsion, and ascend directly upward, and if any such be allow'd them, fly away through any direct narrow passages, the watery parts flowing out at the lateral passages. But here is a rapid propulsion of the whole dissolv'd sanguineous mass into the great Artery, and all its wide, narrow, streight, crooked, upper & lower productions, & that so swift & sudden, that in that small moment of time that the Heart makes that propulsion, so sudden and rapid a separation of the thinner from the thicker, can neither be done nor taught by reason, nor apprehended by Imagination. If the blood attenuated and render'd vaporous in the Ventricles of the Heart, did ascend upwards into the Arteries of its own accord without any impulse, then perchance by reason of its slow progress some such thing might be imagin'd by us; but in regard that the Heart by a sudden contraction impetuously and rapidly expels, as it were, in the twinkling of an eye whatever is in its Ventricles, such a separation can never be made. Thus if any one with a Syringe shall force red Wine boyling hot into a Tube crooked toward the sides, and bor'd through at the upper part with three or four Holes, it will fly forth equally such as it is, at all the holes at the top or sides, whether crooked, wide or narrow, nor will the violence of the force, or shortness of the time allow any separation of the thicker parts from the thinner, much less a particular passage of the thinner thro' the uppermost direct little holes without the thicker. And so it is with the blood forc'd out of the Heart. Besides, the quickest Eye in the world could never observe any difference either in thickness or thinness between the blood ascending upward to the Head through the wide and direct passages, or the blood descending downward through the crooked and broad passages: For that which is taken out of any Animal from the *Carotid*, differs not a tittle from that which descends out of the *Aorta*, or is drawn out of the Iliac Vein by a small Prick; as neither the returning remainder of the blood which descends through the Jugular Veins, differs any thing from that which ascends through the Basilic Vein of the Arm, or the Iliac Veins of the Thighs, unless it pass through any diseased part, but is altogether equal. And yet there would be some difference to be observ'd if the Doctrine of *Cartesius* were true. Lastly, says the most acute Philosoper, the more subtil parts of the blood, compounding these Spirits, want no other alteration but the separation of the most thin parts from the less thin; yet in the mean time he never lets us know what those most thin parts are. 2. Nor how the Brain orders that separation from the rest of the parts of the blood. 3. Nor wherefore, nor how they are mov'd.

As to the firſt I have ſpoken in the definition, that is to ſay, that all the moſt ſubtil parts of the blood, but chiefly the volatile Salt parts conduce to the making of theſe Spirits; of which we ſhall now more at large diſcourſe, as alſo of their ſeparation and motion.

The Matter out of which the Animal Spirits are generated.

IV. *The Matter therefore out of which theſe Spirits are generated is the arterious Blood (conſiſting of a Salt, Sulphureous and Serous Juice) of which not equally all the Parts or Particles, but chiefly the Salt, which by a peculiar quality of the Kernels of the Cortex of the Brain are for the greateſt part diſſolv'd and ſeparated from the ſulphury Particles; and being depriv'd of their Seroſity, are rendred moſt thin and altogether volatile, ſo that they are able with eaſe to penetrate through the diminutive Fibers of the pithy Brain.*

Whether Air concurs with the Matter.

V. *Veſalius, Laurentius, Columbus, Sennertus, Plempius, Fracaſſarius* and many others, are of Opinion, that beſides the blood, Air neceſſarily concurs as the Matter *è qua*, or out of which, to the generation of theſe Spirits, and that by its tranſpiration through the Sieve-like breathing holes of the *Ethmoid* Bone, it penetrates into the Ventricles of the Brain. Which was formerly alſo the Opinion of *Eraſiſtratus* and *Galen*: But that it is far diſtant from Truth, we find partly, for that thoſe things which have been ſaid concerning the ſituation of the ſpungy Bones, and the ſpungy Fleſh ſtopping the upper part of the Noſtrils, partly what has been ſaid concerning the place of the Generation of the Animal Spirits, plainly demonſtrate that the inſpir'd Air cannot penetrate into the Ventricles of the Brain; and then again, that the Animal Spirits are not generated in thoſe Ventricles. Moreover, the Animal Spirits are always generated out of the ſame and like Matter of which, if inſpir'd Air were a neceſſary part, they could never be generated without inſpir'd Air. But on the other ſide, they are generated in thoſe perſons, who being troubl'd with the Poſe, have their Noſtrils obſtructed with ſo great a quantity of Flegm, that by reſpiration no Air can paſs through them. They are alſo generated in the Birth while it lies ſhut up in the Womb infolded in its own Membranes, at what time the Birth does not breath, nor can receive in any Air. They are alſo generated in Fiſh, which though they do not breath in the Air, yet abound with theſe Spirits, as appears by their ſeeing, feeling and nimble motion. Laſtly, they are generated in Birds before they are hatch'd, while they are inclos'd within the ſhell, and cannot receive in any Air. From all which it is eaſily concluded, that inſpir'd Air does not concur to conſtitute the Matter out of which theſe Spirits are made.

The ſeparation of the Spirituous ſalt part.

VI. *Now the Blood is forc'd in great quantity through the Carotid and Cervical Arteries, not only into the Membranes of the Head, but into Subſtance it ſelf of the Brain, Cerebel and Pith; and in its Paſſage firſt through the Cortex, thence through the Pithy Subſtance, the more ſubtil ſalt Particles therein are ſeparated for the moſt part from the ſulphury or oily and ſerous Particles; of which again the thicker Particles ſerve to the nouriſhment of the Bowel it ſelf; but the thinner are ſtill more volatiliz'd, and for the greateſt part being freed from the ſulphury, are changed into a moſt ſubtil Spirit call'd Animal, which flows out of the Fibers of the Brain and Cerebel into the Nerves, and through them to the reſt of the Parts of the Body.*

The ſeparation of the ſalt part from the ſulphury.

VII. *But after what manner, or by what force that ſeparation and thsir attenuation and volatilization is perform'd, cannot eaſily be explain'd, but ſeems to be peculiar to the Subſtance it ſelf of the Brain and Kernels of the Cortex, as being a Subſtance which is chiefly form'd out of ſuch a ſalt Matter, with which ſome few oily Particles being mixt, make up the ſomewhat fatty conſtitution thereof*; and hence through the conformity of that like Matter, it has an affinity with that other ſaltiſh Matter, and eaſily imbibes it, after it has quitted the reſt of the ſulphury and ſerous Matter, and alters it within its little Fibers to greater perfection. Thus *Fracaſſarius* writes that the Cortex of the Brain is more ſalt and ſofter than the Marrow; becauſe the Cortex conſiſts more of melted Salt, but the Pith of Salt ſtrain'd through the Cortex, and conſequently leſs ſerous, and thence more firmly concreted, which he ſays he has often experimented

experimented, and adds an experimental Obſervation not improbable.

Now this Separation happens firſt in the Cortex, as into whoſe innumerable diminutive Kernels, through infinite blood-bearing Veſſels the blood is plentifully infus'd, out of which in thoſe Kernels there is made a ſeparation of the ſalter and moſt ſpirituous part, which flows into the diminutive Fibers of the Brain inſerted at the lower part into the ſeveral Kernels, and ſo in the pithy Subſtance of the lower part of the Brain compos'd of thoſe little Fibers, is brought to the laſt perfection, the remaining portion of the blood returning to the Heart through the little Veins. For as it is the Office of all the Kernels to ſeparate ſome humor from the blood, ſo the ſame thing comes to paſs in theſe Kernels of the Cortex. And as in the Sweet-bread the ſubacid humor is ſeparated, the bilious humor in the Liver by virtue of its little Kernels and Bunches; the ſerous humor in the Kidneys, the Lymphatic in the Kernels of many other parts, or any other humor according to the various conſtitution of the Kernels and the Parts themſelves; ſo likewiſe in the Kernels of the Cortex of the Brain endu'd with a property peculiar to themſelves, there is a peculiar, moſt ſpirituous ſaltiſh inviſible humor ſeparated from the blood, which growing more ſpirituous in the little Fibers of the pithy Brain, has gain'd the Name of Animal Spirit, as being that which obeys the Soul in moſt of its Actions.

Affinity of Particles.

VIII. *Now that in the ſeparation of any Liquor, the Affinity of the Particles is of extraordinary prevalency, appears from hence, for that in the nouriſhment of all the other Parts whatever, the ſame thing is obſerv'd*; as for example, that ſuch Particles of the blood as have the greateſt affinity to the Parts, adhere to them, and are aſſimilated into their Subſtance, whereas the reſt are ſeparated from them and forc'd farther. As in other things alſo we find thoſe things mix moſt eaſily which have moſt Affinity. Thus if Oil and Water be mix'd together, and one end of a long woollen Cloth dipp'd in Water be put into the ſaid Mixture, the other end hanging forth without the Pot, all the Water in the Pot will drip out of the Pot all the length of the Cloth, but the Oil will remain in the Pot. Which Affinity our new modern Philoſophy, not without reaſon, attributes to the agreement of the ſmall Particles and the Pores. As for example, if the ſmalleſt Particles to be receiv'd be round, and the receiving Pores be round, then are thoſe eaſily receiv'd by theſe, becauſe of their Affinity. Alſo if the Pores and Particles are triangular or any other way alike agreeable; but if the Pores are round, but the Particles to be receiv'd triangular or quadrangular, then would the one with difficulty receive the other, nor would there be any Affinity. And thus it is in the Brain; for the Salt or Saltiſh Particles of the blood by reaſon of the Affinity of the Subſtance and the conveniency of the Pores, are eaſily ſuck'd in by the Kernels of the Cortex, and therein are ſeparated from the reſt, as it were by a fermentaceous Motion; and being ſeparated, are eaſily imbib'd by the little Fibers of the Pithy Subſtance, of which this Subſtance is chiefly conſtituted, and are more ſubtiliz'd; but the ſulphureous not ſo eaſily. And therefore only a very ſmall and thin part of the ſulphury Particles, having the leaſt Oylineſs, is mix'd with the Animal Spirits, but the reſt together with the ſerous Particles, partly goes into Excrement, which is then collected in the hollowneſſes of the Ventricles, or is diſſipated in Vapour through the Pores; partly together with the remaining blood being thruſt forward to the extream parts of the Brain, is there ſuck'd up by the Orifices of the ſmalleſt Veins, and ſo circulated farther. However, this is to be obſerv'd by the way, that in that ſame paſſage not all the ſalt Particles are ſeparated in the Kernels of the Cortex, and imbib'd by the Brain; for ſo there would happen a diſſolution of the Compoſition of the blood, but only the more fluid and volatile; but that the thicker remain mix'd with the blood, and are circulated with it; in the ſame manner as in the Kidneys, not the whole *Serum* is ſeparated from the Maſs of the blood, only the thinner part which has moſt affinity with the Pores of the Kidney-Kernels, the reſt continues mix'd with the blood, and is carry'd with it to the hollow Vein.

The ſeparation of the Spirituous from the thick part.

IX. *By what has been ſaid, we underſtand how the ſalt Particles of the Blood are ſeparated in the Brain from the ſulphury and ſerous. But becauſe their moſt ſubtil and moſt volatile parts only are proper for the generation of Animal Spirits, the other thicker Particles ſerving partly to*

the nouriſhment of the Brain, partly going into Excrement, now we are to ſee how the ſeparation of the moſt ſpirituous and volatile Particles from the thicker is perform'd. This is done after the ſame manner as happens in diſtillation of Wine, when the Orifice of the Alembic is exactly clos'd with a large Sponge: For the Chymiſts, to the end they may extract and ſeparate more powerful Spirits, or more clarify'd and purg'd from its Flegm, out of the Wine which is to be diſtill'd, put a Sponge to the Alembic; for ſo thro' the intricate paſſages of the Sponge the Spirits only are wheel'd and contorted, while the more impure and thicker are not able to paſs through; and ſo thoſe Parts which are not cleans'd from their Dregs, but are very watery, are ſeparated and ſet aſide, while the more ſubtil Spirits go forth and through the Beak of the Alembic fall into the Receptacle. In like manner, in the Cortex of the Brain, the ſeparated ſalt volatile Parts of the blood are ſuck'd up by the diminutive Fibers which are endow'd with moſt obſcure narrow Cavities. Through which narrow Paſſages while thoſe Spirits are wriggl'd and contorted, whatever are leſſer purify'd and thicker, and more and more caſt away and thrown off, as the other are exalted into an incorporeal tenuity, and flow into the Pith, as into the next Beak of the Alembic, and thence into the Nerves, as being the leſſer Beaks deriv'd from the greateſt; while in the mean time the thicker Salt leſs volatile Particles of the blood ſerve for the nouriſhment of the Bowel it ſelf; but the reſt which are yet more fix'd remaining in the mixture of the ſanguineous Maſs, flow back to the blood-bearing Veſſels through the wider Pores, and are ſent back for Circulation. Now this expulſion of the Spirits out of the ſmall pory Fibers of the Brain and Pith to the Nerves, is forc'd by one and the ſame Cauſe, that is to ſay, the alternate falling of the Brain after dilatation, by which, as by a certain compreſſion, the Spirits and Humors which are in the Brain, are excited to flow forth.

And thus by the Cortex of the Brain and the Medullary Subſtance the Salt is ſeparated from the Sulphury and Serous, the pure from the impure, the ſubtil from the thick, and that Subtility by the proper force already demonſtrated of the ſaid Subſtance, proceeding from the volatil Salt which abounds in it, is exalted to the height of volatility. And hence alſo flowing out of the Subſtance and little Fibers of the Brain and Pith, it ought not to be contain'd in looſe Veſſels hollow'd like a Pipe; for out of ſuch it would eaſily fly away; but in ſuch firm and more ſolid Receptacles or Channels, in which there are the ſmalleſt and moſt inviſible Pores, and ſuch Channels are the Nerves, as through which they may paſs freely to their height of volatility and tenuity.

X. ***However we are to take notice, that although the Animal Spirits are made after this manner out of the ſaid Matter, nevertheleſs they are not exalted to an equal degree of Volatility in all men.*** For in ſome they are thinner and more active, in others thicker and of a ſlower Motion, according to the vulgar Phraſe, either purer or impurer; becauſe the ſalt particles of the blood out of which they are generated, are in ſome more, in others leſs viſible. And the Brain it ſelf in ſome is impregnated with a more copious, in others, with a leſſer quantity of volatil Spirit; and being hotter in ſome, volatizes the Spirits more; being colder in others, thickens and fixes them more. And therefore in Melancholy Spirits and ſuch as continually feed upon thick, hard, ſalt and raw Food, and whoſe Concoctions are for that reaſon worſe, thicker and leſs ſpirituous Humors are generated; and among the reſt the ſalt ones are leſs volatiliz'd; whence the Animal Spirits are thicker and leſs active; as in Country people, and poor people, and ſuch as inhabit the cold polar Regions, and uſe ſuch a ſort of Diet for want of a thinner; who are therefore ſlower to all manner of Animal Actions, and of dull Wits. Whereas on the other ſide, they who live in hotter Regions, abounding with plenty of all ſorts of wholeſom Diet, and ſeldom feed upon ſalt or ſmoak'd Meats, but accuſtom themſelves to a thinner and more wholeſom ſort of Diet, and conſequently are ſerv'd by their Bowels with better Concoctions, their Humors and Spirits are thinner and more volatile, and their Bodies and Wits more nimble and active. *Ariſtotle* indeed ſays, that Melancholy People are ingenious; but this is not to be underſtood of ſuch as are altogether melancholy, and together with a thicker blood have

The diverſity of Spirits in thinneſs & thickneſs.

thicker

thicker Spirits; but of such as incline to Melancholy, and consequently whose Spirits are neither too thin and volatil (for such are too movable and inconstant) nor too thick (for they are stupid) but in a middle temper between both. And therefore such People are neither too quick nor too tedious in the transaction of Business, but prudently weigh and judge of things before they proceed to Execution.

The Passage thro' the Pores of the Nerves.

XI. *Perhaps it may seem strange to some People, that the salt Particles should be made so subtil and spirituous, as to be able to pass freely thro' the invisible Pores of the Nerves.* But they will cease to wonder, when they observe in Chymistry the extraordinary Subtility and Volatility of Volatile Salt; and how swiftly the Spirits of Salt will pass through the invisible Pores of the earthen Vessels. Nay, if they only consider how common Salt without any mixture of Water or Moisture being dissolv'd into Pickle, will penetrate through the thick sides of wooden Vessels, and sweat through Stone Pots overcast both within and without with a Glassie Crust, as we find in those Vessels where we salt our Beef, or keep our pickl'd Fish. If then fix'd Salt only melted, passes through the Pores of the Vessels, how much more easily will the most subtil Spirit of volatil Salt pierce through the Pores of the Nerves?

Why these Spirits do not corrode by reason of their Acrimony.

XII. *Here some will object, That Salts and Acids are sharp and corroding, so that if the Animal Spirits were generated out of the salt Particles of the Blood, and consequently participated of any Saltness they would corrode all Parts whatever by reason of their Acrimony, which would occasion Pains and many Inconveniences.* I answer, That it is certain that the Animal Spirits are indu'd with some slight Acrimony, but not so much as to occasion any sensible molestation; because that exceeding Acrimony which is in fix'd Salt, by reason of the sharp pungent Particles conjoyn'd with it, becomes mild in that volatil and vaporous Spirit, because the small sharp Particles being dissolv'd, are more remote one from another, and their Force is broken by the intervening Air or some steamy Vapour. For example, if any one go into a Cellar, and draw in the Air that is all intermix'd with a most subtil exhaling Spirit, or if he snuff up into his Nostrils the spirituous Vapor of Wine heated at the Fire, yet shall he not feel the least grievance, nor perceive any Acrimony, which he would do if he snust up into his Nostrils the Spirit it self fix'd in the Liquor. So in our great Salt-Works, where the Sea-Salt is boyl'd and depurated, the exhaling Vapors being impregnated with the volatil Salt, if they be taken in at the Mouth or Nostrils, little or no Salt-Savour shall be perceiv'd therein, whenas the fix'd Salt is most sharp. And this comes to pass, because the Forces which are conjoyn'd in the fix'd and thick Body, and for that Reason are very powerful, in the dissolv'd and vaporous Body are separated, and thereby render'd weak and of no strength. And this is the Cause why the Animal Spirits do not corrode, because that being dissolv'd into a most subtil Vapor, they have not so much Acrimony in them as can be troublesom to any Part. To this we add, that they have a most thin and subtil serous Vapor, together with so much sulphury Spirit joyn'd with them for a Vehicle, which does not a little weaken and temper the Acrimony. Moreover, the Parts themselves through which they pass, and into which they flow, partake of some other Moisture, which also much weakens and diminishes their Acrimony.

The Difference between the Animal & Vital Spirits.

XIII. *From what has been said, it is sufficiently apparent that the generation of the Animal Spirits is not Animal, but meerly Natural, and that they differ not only in some Accidents or Qualities, but in their whole Kind from the Vital.* For in these the sulphury Juice mixt with the salt, is far more prevalent; in those there is very little sulphury or any other Juice apt to take Fire. These are extracted out of the *Chylus* and veiny Blood; those only out of the salt part of the arterious blood. These flow visible through the large Arteries and Veins; those invisible through the invisible Pores of the Nerves. Over those the Soul has no power, over these it has.

And therefore there is a vast difference between the Animal and Vital Spirits. But now the Question is, whether the Animal Spirits themselves do not differ one from another, in Substance, in Manner and Place of Generation and in Use? Whether some are not generated out of the Blood, others

out

out of the *Lympha* or ſome other Matter? Alſo, whether ſome are not generated in the foremoſt, others in the middle, others in the hindmoſt Ventricle? Or, as *Willis* lately tells us, whether ſome are not made in the Subſtance of the Brain, others of the Cerebel? Laſtly, whether ſome peculiar and differing from the reſt, do not cauſe the Sight, others the Feeling, others the Hearing, others the arbitrary Motion, and others the ſpontaneous Motion? I anſwer, That the Animal Spirits are not generated out of a different Matter, nor in various Parts (for we take the Brain and Cerebel for one part) neither do they differ one from another, but are all of the ſame Nature, Compoſition and Condition; but that the diverſity of their Operations ariſes from the diverſity of the nature & condition of the Parts into which they flow; as thoſe which flow into the parts adapted for feeling, as the Membrane & Skin, thoſe cauſe the Feeling; thoſe that flow into the Eye, cauſe the Sight; thoſe that flow into the Ear, cauſe the Hearing; thoſe that flow into the Muſcles, Fibers and other Parts, ordain'd for Motion, cauſe Motion; though they be the ſame and no way different; as every Inſtrument is adapted to this or that proper Action. In the ſame manner as the Beams of the Sun, which though they be always the ſame, and proceed from one Sun, neither confer any other Light, or other Strength, or any other thing to any other Things, yet produce moſt different effects according to the difference of the Conſtitutions of the things into which they flow. For here they produce Barly, there Trees, in another place Stones, here Worms or Fiſh, ſometimes Inſects or other things. Here they extinguiſh Life, there they are the cauſe of it; here they ſoften, there they harden.

As to the Motion of the Animal Spirits through the Nerves, ſee the foregoing Chapter.

The two-fold Uſe of theſe Spirits.

XIV. *To theſe Animal Spirits hitherto no other Uſe was attributed, only that they are ſerviceable to the Animal Actions, that is to ſay, the principal Faculties, the Senſes and the Animal Motions; which is not to be deny'd: but beſides this, there ſeems to be another natural Uſe to be aſſign'd them, which is, that they conduce in a high meaſure to the nouriſhment of the Parts, eſpecially the Spermatical.* This is chiefly apparent from hence, becauſe that as the blood continually flows out of the Heart thro' the Arteries, ſo likewiſe theſe Animal Spirits continually flow from the Brain through the Nerves to the Parts, and that naturally, without the determination or appointment of the Soul, even when the Mind makes no appointment at all, as in Sleep and in ſoporiferous Diſeaſes.

But altho' beſides this natural Motion perpetually proceeding, they are frequently mov'd by another determinated Motion proceeding from the Mind; yet that detracts nothing from the continual natural Motion, but that theſe Spirits by virtue of that, may be ſerviceable to the Action of Nutrition, as they are thereby ſerviceable to the Animal Actions. For the blood when the Body is at reſt, is forc'd out of the Heart through the Arteries by a ſetled continual Motion to the nouriſhment of the Parts; ſhall it therefore when by reaſon of any extraordinary Exerciſes or heating of the Body, it is ten times ſwifter and more rapidly mov'd and forc'd out, be no longer proper for the nouriſhment of the Parts? Certainly no man of Reaſon will ſay, that that ſame ſecond rapid Motion deſpoyls the blood of its nutritive Quality. And ſo likewiſe the more rapid determinative motion of the Spirits, often altering the firſt continual Motion, cannot be ſaid to deprive them of their Quality neceſſary to the Aſſiſtance of Nutrition.

Objection.

XV. *But ſome will ſay, How can the Work of Nutrition equally proceed in the Parts, when ſometimes more, ſometimes fewer Animal Spirits flow into theſe or thoſe Parts?* For it ſeems that thoſe into which fewer Spirits flow, ſhould be leſs, thoſe into which more Spirits paſs, ſhould be more nouriſh'd. I anſwer, that the ſame thing befalls theſe Spirits as befalls the blood, which though it be more rapidly and in greater quantity thruſt forward into the Parts upon extraordinary Exerciſes and Heats of the Body, yet does it not nouriſh them ever a jot the more, puſh'd on by its ordinary continual Motion, in regard that rapid Motion of it is caus'd by the great Heat; by Motion and Heat the blood becomes more thin and ſubtil, and the Pores of the Parts more looſe; ſo that the blood may not be able to ſtick ſo cloſe to the Parts, but that a great quantity of it may be diſſi-

dissipated. So also these Spirits, when they are frequently determin'd in greater quantity to these or those parts, endue them indeed with a firmer solidity, but no larger augmentation; because the chiefest part of them, by reason of their tenuity, is dissipated; and what is not serviceable for nourishment, or is not dissipated, that, being pour'd forth according to custom, into the Substance of the Parts, and being somewhat thickned, enters the extremity of the Veins, together with the remainder of the Blood, and is mixt and circulated together with it, and carry'd to the heart. Of which Circulation *Rolfincius* and *Deusingius* take notice.

What these Spirits contribute to nourishment.

XVI. ***Now we are to take notice what these Spirits afford or contribute to Nourishment.*** It has been said, *l.* 2. *c.* 12. that the blood consists of a sulphury, salt and serous Juice, and that it is forc'd forward every way for the nourishment of the Parts. Therefore in its Mass there are two sorts of Substances, serving to the nourishment of the Parts, Sulphur and Salt. Mercury is a third, for the most part unprofitable indeed for nourishment, but altogether necessary for the conjunction, mixture, and as a Vehicle of the former.

But of the two former, some serve for the nourishment of the fleshy and fat parts; others to the nourishment of the Spermatic parts. The fleshy and fat parts are chiefly nourish'd by the sulphury particles of the blood, which serve to endue them with an Oily softness and something of sweetness. Nevertheless there are some salt particles, to render the parts more firm and solid. But when that in those parts the sulphury particles predominate above the salt, then are they softer and fatter; where less prevalent, more fleshy and firm. The Spermatic parts are nourish'd by the salt particles of the blood, which render them more solid and hard: yet have some sulphury particles mix'd with them; according to whose lesser or greater proportion and dissolution, some parts are softer, as the Membranes, Veins and Arteries; others harder, as the Bones and Gristles.

The progress of Nutrition.

XVII. ***But to the end this nourishment may be carry'd on without any obstruction, there is of necessity requir'd some kind of separation of the salt particles from the sulphury, that the one may the better be enabled to adhere to the Spermatic, the other to the Fleshy and Fat Particles, and be assimilated to them.***

This Separation is caus'd by the Animal Spirit; which by its influx, which as it were coagulating by a slight kind of effervescency and peculiar affinity, the salt particles, separates them from the sulphury, to the end they may be affix'd to the spermatic parts, and by the means of the heat and a small sulphureous Vapor, be assimilated to them; and as the spermatic parts are more or less dry or moist, and more or less of the sulphury particles are mix'd with them, so the salter particles of the blood are more or less harden'd in them. Thus they become altogether dry and hard in the Bones, but softer in the Membranes and Fibers, *&c.* These salter particles being thus moderately separated out of the remaining more sulphury Mass of the blood, that which is proper goes to the nourishment of the fleshy and fat parts. So that the Animal Spirits supply the place of a subacid Rennet or *Coagulum*, which is extracted out of Salt and salt things.

For that such a sowr Ferment or *Coagulum* causes the separation of salt and sulphury particles is most evidently apparent in Chymistry. For if you mingle Spirit of Wine, wherein there is ten times a greater proportion of sulphury than salt particles, with Spirit or Water of Tartar, which consists of Salt Tartarous particles thinly dissolv'd and melted, the Mixture will be exact; into which Mixture if you pour in never so little Spirit of acid Salt or Vitriol, there will be presently an Effervescency, by which the salt particles will be separated from the sulphury and watery, and being coagulated, they will fix and precipitate to the bottom.

Thus also, by the mixture of Animal Spirits, which are endu'd with a gentle subacidish quality, the salt particles of the blood flowing into the parts, are in a moderate quantity gently separated from the rest, and are somewhat fix'd and coagulated with the Spirit it self and by that means are agglutinated, grown to, and plainly assimilated with the spermaric parts; but those which are less salt, and more sulphury, adhere to the fleshy and fat parts, and are united with them. But those particles which are for the most part depriv'd of Spirits, and less proper for nourishment, flow back through the Veins together with the remaining part of the blood, to be impregnated with a

new

new fermentaceous Humor, proceeding from the Liver and Spleen, and to be ſpiritualiz'd anew in the Heart, either with new *Chylus*, or alone without it.

But if ſuch a ſeparation of ſalt and ſulphury particles from the Animal Spirits flowing through the Nerves, be requir'd in the Parts for the carrying on of the nouriſhment, the Queſtion will be, how far this Affair ſhall be carry'd on in ſuch parts into which there are no Nerves inſerted, as in the Bones and the like? As alſo in thoſe which admit but very few Nerves, and yet in reſpect of their Largeneſs and their Uſe, require much nouriſhment. I anſwer, that there are no parts to which Nerves do not reach, only to ſome more and larger, to others fewer and leſs, as ſome require a greater, others a leſs proportion of Animal Spirits for the Duties of Sence and Motion, and alſo Nouriſhment; which is the Reaſon that in ſome there is a greater, in others a leſſer ſeparation of the ſalt from the ſulphury particles. The Bones, becauſe they are nouriſh'd chiefly by the Salt and Tartarous Spirits of the Blood, want many Animal Spirits, to cauſe a ſtrong ſeparation of the ſalt particles from the ſulphury, and therefore they are all invelopp'd with a *Perioſtium*, into which theſe Spirits flow in great quantity through the Nerves, and from thence penetrating into the Pores of the Nerves, efficaciouſly perform their Office; and though no manifeſt Nerves ſeem to enter the Bones, yet that they enter into ſome, is apparent by the Teeth; and 'tis probable that they enter many other Bones, though ſo ſmall, as not to be diſcern'd by the Eye. And ſuch Bones into which they do not enter, there the *Perioſtium* receiving the Spirits from the Nerves, ſupplies the Office of the Nerves. But where there is neither Nerve nor *Perioſtium*, they have their juſt magnitude from the beginning, conjoyn'd with a peculiar hardneſs, and afterwards neither wear nor increaſe, as the little Bones of the Ears, as the Mallet, the Anvil and the Stirrup. The Heart which is fleſhy, becauſe it requires not ſo great a quantity of Salt for its nouriſhment, nor is to be mov'd by a voluntary Motion, and becauſe it makes and contains within it ſelf a ſharper ſort of Spirits, needs very few Animal Spirits, and therefore is furniſh'd with very ſlender Branches of little Nerves. The Liver and Lungs, becauſe they are furniſh'd with fermentaceous and ſowr Juices from other parts in ſufficient quantity, the one from the Heart, the other from the Spleen, receive very ſmall Nerves diſpers'd chiefly through the involving Membrane, and hardly entring the *Parenchyma* or body of the Bowel. The Spleen admits a greater number of Nerves and Animal Spirits; for that making the Matter of the Ferment out of the Arterious Blood, the acid ſalt particles of the blood are to be more ſtrongly ſeparated therein from the ſulphury. And thus it is in the reſt of the Parts; among which, the more ſolid always require more, the ſofter fewer Animal Spirits; and of the ſofter, thoſe that are water'd with more Animal Spirits, are harder than other ſofter parts, as we ſhall make out when we treat of the Muſcles.

Now that ſuch a kind of Quality is moſt neceſſary in the Animal Spirits to promote the Nutrition of the Parts, ſundry Arguments demoſtrate.

1. Becauſe thoſe Parts which are exercis'd moſt and oftenеſt by the voluntary animal motion, and into which, to cauſe that motion, of a neceſſity a greater proportion of Spirits flows, than into ſuch Parts as are leſs exercis'd; becauſe I ſay thoſe Parts, for the better ſeparation and coagulation of the ſalt particles of the blood from the ſulphury, are nouriſh'd with a more ſolid Nouriſhment, and conſequently become much more hard and ſtrong than other parts which are exercis'd leſs, and into which thoſe Spirits for that reaſon are not ſo copiouſly determin'd, but only flow into them according to their ordinary courſe. This we find in moſt men, whoſe right Arm and Hand is much ſtronger than the left, becauſe of cuſtom the one is ten times more made uſe of than the other, as being the Inſtrument of moſt of our Actions; for which reaſon a greater proportion of Spirits is determin'd to the one than to the other; in which, becauſe there is not ſo plentiful a mixture of Animal Spirits, there is not ſo great a ſeparation and fixation of the ſalt and ſulphury Spirits; and conſequently leſs firm Nouriſhment, though ſometimes the Bulk and Thickneſs may ſeem greater. But that which is oppos'd, in regard that by reaſon of the leſs coagulating Effervеſcency, it is leſs freed from the ſulphury Spirits, it becomes ſoft, pappy and fat, and affords leſs ſtrength to the Member.

2. Becauſe in ſuch perſons that walk much and frequently, their Thighs are much firmer and ſtronger, than in ſuch who

who being given to Lazineſs, ſeldom walk, and yet their Thighs are fatter, more fleſhy, ſofter and thicker. And then again, thoſe that walk much are much ſtronger in their Thighs than in any other parts of their Body, which they exerciſe leſs, and therefore they are fit for walking and running, but not for any other Labour.

3. Becauſe for the ſame reaſon it is, that Women and lazy people are fat and ſoft, but weak; becauſe there is no other than only the ordinary influx of Animal Spirits into the Parts; and hence a greater quantity of the ſulphury particles of the blood mixt with ſalt, and leſs ſeparated from them, are appos'd together with the Salt, which renders the Nouriſhment leſs firm.

4. Becauſe that in Paralytic Perſons, in whom very few Spirits or none at all flow into the Members that ſuffer, firſt the ſuffering parts for ſome time are languid and ſomewhat ſwelling with an Impoſtume-like Tumor, and at length grow lean and wither'd, though much blood is forc'd to them through the Arteries.

5. Becauſe that ſuch as uſe immoderate Venery waſte away, by reaſon of the great conſumption and waſte of Animal Spirits, which for that cauſe flowing in a leſſer quantity to the nouriſhment of the Parts, Nutrition is obſtructed, and thence follows a leanneſs and waſting of the whole body.

6. Becauſe in an ill temper of the Brain and upon ſeveral Diſeaſes an Atrophy follows, either becauſe of the conſumption of theſe Spirits, or becauſe few are generated, or thoſe that are generated are vicious.

Thus *Malpigius* frequently obſerves, that ſuch as have receiv'd any Wound in the Brain, at length die of a Conſumption.

7. Becauſe ſuch an Atrophy caus'd by the ill temper of the Brain and Spirits, has been often cur'd by Remedies apply'd to the Head alone; by which the Animal Spirits being reſtor'd to their former Sanity, Nutrition has had its uſual Courſe.

8. Becauſe upon the cutting of any Nerve, that Part to which the Nerve was carry'd, ſhall conſume and periſh for want of Animal Spirits. Of which *Riolanus* gives us an elegant Example. *Nicephorus Gregorius*, ſaith he, *ſaw a young Boy once, that being ſhot with an Arrow into the Neck, the Arrow had cut the Nerve; upon which the contrary Foot was ſeiz'd with a Numneſs, and the Diſeaſe remain'd incurable: and though the other Foot grew as the Boy grew, the other Leg retain'd its firſt exility and Shortneſs, hanging looſe and uſeleſs. Upon which many that underſtood not the Cauſes and Reaſons of things, were ſtrangely amaz'd how it came to paſs, that the Hand which was much nearer the Wound was altogether inſenſible of the Hurt, when the Foot ſo far diſtant, was ſo deeply affected with it.*

But by reaſon Anatomy was not ſo well underſtood in that Age, the cauſe of that Accident was not ſo well diſcern'd by the Phyſicians of that time, which was certainly this, becauſe the Arrow had not ſtruck the Nerve after its ſeparation from the Pith, and its ſtarting out through the Side-holes of the Spiny Fiſtula; for there is no Nerve that ſlides through the Vertebers of the Neck, which deſcends to the Thigh and Foot, but penetrating within the Spiny Fiſtula, had cut the Nervy Strings in the Pith it ſelf which deſcends to the Loins and the holy Bone, and thence to the Foot, and for that reaſon the influx of Spirits into the Foot, failing, the Foot dry'd up and ceas'd its growth.

So that which way ſoever we conſider the Matter, it will appear that the Animal Spirits neceſſarily concur to the Office of Nutrition. And moreover, that in the Spleen they ſeparate the Matter of Ferment out of the arterious Blood, neceſſary for the preparation of the Blood and the *Chylus*.

Theſe things *Gliſſon* and *Wharton* ſeem in ſome meaſure to have ſmelt out, and *Lambert Velthuſſius* treading their Footſteps. Only in this they were deceiv'd, that beſides the Animal Spirits, they thought there flow'd through the Nerves ſome other ſort of Nutritive Juice, which of it ſelf nouriſh'd the Spermatic Parts. Which Error proceeded from that whitiſh Juice reſembling the White of an Egg, which when the Nerves are hurt, is often gather'd together in the Nerves or about them, vulgarly call'd *Aqua Articularis*. Which Humor however, does not diſtil from the Nerves when hurt; for ſuch a ſlimy Juice could never paſs through the inviſible Pores, but is a Humor that uſually ſettles about the Joints to render them moiſt and ſlippery, which upon a too copious mixture with the Animal Spirits flowing out of the endamag'd Nerves, grows thick and coagulated, many times to the Conſiſtence of the White of an Egg. Which

loſs of Spirits cauſes a debility and Atrophy in the Part.

I thought good to inſert this paradoxical Opinion of mine into theſe Anatomical Exerciſes in few words; upon which others may comment more at large, becauſe that from this foundation the Uſe and Nature of many other parts may be gather'd. There remain two things more to be unfolded. *Firſt*, Whether the Animal Spirits are the next Inſtrument of the Soul; concerning which thing *Plempius* accurately diſcourſes *l.* 2. *Fund. Med. ſect.* 4. *c.* 1. The *next*, How theſe Spirits being generated in the Brain, and flowing with a continual and natural Motion to perfect the Nouriſhment of the parts, are mov'd by the Mind by another deſigning Motion, and are ſent ſometimes in a larger, ſometimes in a leſſer proportion to ſundry parts. But theſe things which chiefly concern the Actions of the Soul, ſeem not to be the proper Subject of our Diſcourſe, wherein we have deſign'd to write not of the Soul, but only of the Body of Man; and therefore as for thoſe that are covetous of Satisfaction in this particular, I think fit to ſend them to the Philoſophers, who have on purpoſe ſet forth whole Treatiſes of the Soul and its Actions; which however I adviſe to be read with great Judgment, ſince not a few of them have feign'd many and wonderful idle Dreams in that particular.

CHAP. XII.

Of the Face.

IN the foregoing Chapters we have endeavour'd to diſplay what is to be found in the Hairy Part of the Head; now we come to the ſmooth Part, which is call'd the Countenance, or Vultus, a Voluntatis judicio, *from the Judgment of the Will, becauſe it diſcovers the Will. It is alſo call'd* Facies, *by the* Greeks προσωπον, *becauſe it diſtinguiſhes Men from Brutes, and ſhews that there is a Celeſtial Spirit contain'd in them.*

For if we more ſeriouſly conſider the ſtructure of the Face, its ſingular Beauty and Splendor, we cannot but diſcern ſomething that is wonderful and divine therein. Whence *Ariſtotle* very well obſerves, that the whole man is comprehended in his Face as in the *Compendium* of a little Picture.

For the Wiſdom of the ſupream Architect more than ſufficiently appears in the ſeveral parts of human Body; yet both the Beauty of the Face alone, and its wonderful agreement with the Soul, draws the Elegancy and Dignity of all the reſt of the Parts as it were into a *Compendium*, and ſeems to ſhew therein the Affections of all the reſt of the Parts as in a Looking-glaſs. For from thence we gather not only the Marks and Symptoms of Health, Diſeaſes and approaching Death, but alſo make ſhrewd Conjectures of the Ingenuity, Diſpoſitions and Manners of Men. For as in the Cheeks Baſhfulneſs and Terror, in the Eyes Anger, Joy, Sadneſs, Hatred, and chiefly Love diſplay themſelves; in the Forehead, Gravity and Humility; in the Eyebrows, Pride; in the Chin, Majeſty; ſo by the Noſe, Sagacity or Stupidity; by the Motion of the Face, Wiſdom or Folly, Honeſty or Knavery, Civility or Ruſticity, Reverence or Contempt, good or ill Will; by the Colour we diſcover the Temperaments of the whole Body. Moreover, by the Face we diſtinguiſh of Sex, Age, Life, and Birth. Therefore it is the moſt certain Image of the Mind, and a clear Mirror reflecting back thoſe things which lie conceal'd, wherein both the external and internal Senſes diſcover themſelves, and all the Motions and Perturbations of the internal Faculties are diſplay'd.

The Parts of the Face.

I. *The Face conſiſts of Parts containing and Parts contain'd.*

The containing Parts are common or proper.

The common are the Cuticle, the Skin, which is here very thin; the Fat, of which there is none either in the Eye-brows or Noſe, and very little in the Lips and Region of the Chaps, where it is ſo interwoven with Muſcles, that it cannot be ſeparated from the Parts annext to it. The Fleſhy Pannicle, which below the Eyes is ſo thin, that Riolanus *thought it to be altogether wanting in that Part.* In the Forehead it is much more fleſhy, and ſticks ſo cloſe to the Skin, that it can hardly be ſeparated from it; and is alſo ruddy in that Part, becauſe of the

the frontal Muſcles interwoven with it.

The proper Parts are Muſcles, Bones, Griſtles, and other Parts to be deſcrib'd in their due Places.

The Face is divided into the upper and lower Part.

The upper Part from the Hair to the Eye-brows, is call'd Frons, *the Forehead*; and in this part in a Body entire is referr'd to the Face, whereas in a Skeleton it belongs to the Skull.

The lower Part extended from the Eye-brows to the extremity of the Chin, contains the Eyes, the Noſe, the Cheeks, and other Parts eſpecially to be deſcrib'd, and in Men, round about the Mouth is adorn'd with a Beard.

The Forehead.

II. Frons, *the Forehead, is ſo call'd* a ferendo, *becauſe it carries the Signs of* Gravity, Sadneſs, Mirth, Moroſity, &c. *The* Greeks *call it* μέτωπον, *as much as to ſay,* μετὰ ὄπας, *the Part above the Eyes.*

The Muſcles of the Forehead.

III. *The Skin of this Part is moveable, becauſe it is furniſh'd with two large Muſcles, which* Riolan *calls the fleſhy muſculous Membrane; on each ſide one, riſing from the Scalp, near the Coronal Suture, and ſticking cloſely to it, which at the ſides are knit to the Temple Muſcles, and above are ſomewhat diſtinguiſh'd in the middle, but below ſo cloſely joyn'd together, that they ſeem one Muſcle. They terminate at the Eye-brows, which they lift up, and contract the Fleſh which ſticks cloſe to them, into Folds and Wrinkles.* *Bartholinus* writes, that he obſerv'd in a Perſon that had a large Noſe, an Appendix of theſe Muſcles extended even to the Griſtles of the Noſe.

The Parts of the Face.

Theſe Wrinkles Phyſiognomiſts obſerve, and take from thence the Signs of the Nature and Fortune of Men, and often foretel Wonders concerning future Events that ſhall happen to them. And the better to perſwade the credulous of the certainty of their Predictions, diſtinguiſh the Wrinkles into ſtreight and tranſverſe; and of theſe they make ſeven in number, conſecrated to the ſeven Planets; all which they confeſs do not appear in all men, but that ſome are wanting in ſome People; only that they are for the moſt part conſpicuous, which are appropriated to *Mercury*, *Venus* and *Jupiter*, eſpecially if the Eye-brow be lifted up, which happens to thoſe that are under deep Meditation; or that the Skin of the Forehead be contracted, as when men are angry, which cauſes a corrugation both of the ſtreight and tranſverſe Wrinkles. But how frivolous and uncertain theſe Predictions are, beſides daily Experience, what we have diſcours'd at large concerning the Influences of the Planets, *l. de Peſte*, plainly demonſtrate.

The ſaid Frontal Muſcles derive little Nerves from the Branch of the third Pair, proceeding from the hole of the *Orbit* of the Eye. They are furniſh'd with little Arteries from the external *Carotides*; and ſend forth little Veins to the Jugulars.

They have ſtreight Fibers, by which they draw the Skin ſtreight up, not tranſverſe or oblique, as *Columbus* and *Aquapendens* aſſert contrary to ocular Demonſtration and Reaſon.

Muſcles of the hinder part of the Head.

IV. *Here by the way we muſt obſerve without the Face, that two Muſcles very ſlender, ſeldom remarkable, are to be found in the hinder part of the Head, which being ſhort, thin and broad, ariſe from the tranſverſe line of the hinder part of the Head, in which the Muſcles moving the Head end; and being furniſh'd with ſtreight Fibers aſcending upwards, terminate in a broad Tendon, and touch the Muſcles of the Ears at the ſides.* By theſe Fibers, which belong to thoſe more remarkable Muſcles, the Skin of the Head is drawn toward the hinder parts, which *John Schenckius* teſtifies of himſelf, and *Columbus* of his Maſter.

Under the Forehead are contain'd the Domicils of the four Sences, Seeing, Hearing, Smelling and Taſting. The fifth Sence of *Feeling*, has no particular habitation in the Face, but is diſpers'd over the whole Body.

CHAP. XIII.

Of the Eyes in general.

THE *Eyes in Latin*, Oculi; *in Greek*, Ὀφθαλμοὶ & ὄμματα, *are the Organs of Sight, form'd and conſiſting of ſeveral ſimilar Parts for the ſake of ſeeing.*

Theſe, like the Stars and Luminaries of our Bodies, are plac'd by the Supream Creator in the upper part of our Body, that as Sentinels from a high Watch-Tower, they may be able to diſcover fortuitous Accidents, what to avoid and what to entertain, and thro' the admirable Conſtruction, Elegancy and variety of viſible Objects, to evince us of the Omnipotency of the inviſible God. For they are the Tapers of the Bodies, which like the Sun, give light to Man: For as the ſhining Sun illuminates the wide World, but withdrawing his Beams, is the cauſe of Darkneſs; ſo the Eyes being perfect and open, illuſtrate the Microcoſm, and diſplay the wonderful Works of God; but being blinded, involve the little World in darkneſs, and compel miſerable Man to live perpetually as in an obſcure Priſon in perpetual Darkneſs; for that being depriv'd of thoſe Windows, he is alſo depriv'd of all Light, his firſt and chiefeſt Pleaſure.

Now if the Structure of the Eye be but more narrowly conſider'd, certainly there is no man living, whom the immenſe Wiſdom of the Supream God will not raviſh into Admiration and Amazement, who in the framing theſe Organs, was ſo much the more exquiſite in his Workmanſhip, by how much the Sight excels all the reſt of the Senſes in Excellency and Dignity.

The Number. I. *The Eyes are in number two*; partly for the greater perfection of the Sight; partly that if the one ſhould happen to be hurt, the other might ſupply the Office and Duty common to both. In Man they are diſtant but a ſmall ſpace the one from the other, in Brutes their diſtance one from t'other is far greater.

The Figure. II. *If you look upon the Ball it ſelf, their Figure is round and ſpherical, to render them the more apt for Motion, and more fit to receive the viſible Rays. But if you conſider the Eyes together with their Muſcles annex'd to the hinder part, then their ſhape is ſomewhat oblong, like the Root of a Tulip.*

Their Colour. III. *Their Colour in Men is ſomewhat various; in ſome blewiſh, in others yellowiſh, in others black*; which Variety is moſt conſpicuous about the Apple of the Eye in the Rainbow, and proceeds from the colour of the Uveous Coat. In the Kindom of *China*, by the report of Travellers, the Inhabitants have black Eyes; but in *Tartary*, green. In Brutes of the ſame kind there is not obſerv'd ſo great a Variety. The Cauſes of theſe Colours are at large ſet down by *Ariſtotle*, *Simon Portius* and *Montaltus*, to whom I refer the Reader.

The Bigneſs. IV. *The Bigneſs of the Eye in Men is but indifferent, not in all Men exactly equal; yet ſuch as ſuffices to receive the Rayes of viſible Things.* However that ſmall difference in the Bigneſs, does not a little contribute to the greater or leſs perfection and ſtrength of the Sight. For large and Goggle Eyes are much duller of ſight than thoſe which are leſs, and more retir'd within the Head, the reaſon of which is to be ſeen among the Optic Writers.

Their Conſent. V. *There is a wonderful Sympathy and Agreement of the Eyes one between the other, by reaſon of the Optic Nerves adhering to them in the middle at the top of the Pith*; as alſo by reaſon of the moving Nerves ariſing from one and the ſame Original. And hence if the one be afflicted by any external Accidents, the other languiſhes immediately, and the one can hardly be preſerv'd from the detriment of the other.

The Light of the Eye. VI. *They have a certain Light in themſelves which accompanies their firſt Formation; leſs in Man, who is chiefly employ'd in the day-time; greater in thoſe Creatures that prey in the Night; as Dormice, Owls and Cats, whoſe glittering Eyes diſpel the Darkneſs round about them.* And *Laurentius Bauſchius* reports upon his own View, that he has ſeen the Eyes of Lions ſo brightly ſhining after Death, that you might diſcover the bottom of the Choroid through the hole of the Uveous Coat, as it were of a Gold-colour. Now

Now becauſe there is a great confluence of Animal Spirits to the Eyes, hence they manifeſtly diſcover the Signs of Health or Sickneſs. In a healthy Perſon a proper and convenient conflux of theſe Spirits renders them full, glittering and lively. But in perſons that are ſick, the ſmaller quantity of thoſe Spirits flowing into the Eyes, makes them look fall'n, ſad, troubl'd and obſcure; till at the laſt endeavours of fading Nature, at length the dazl'd and broken Sight foretels the utter Ruine both of Strength and Life.

Whether diſeas'd Eyes be contagious

VII. *That theſe Spirits being endu'd with evil Qualities, and darting from the Eyes, defile Looking-Glaſſes, and by contagion infect others with an* Ophthalmy, *formerly* Ariſtotle, Galen, Alexander, *and many modern eminent Phyſicians have erroneouſly believ'd.* For the Animal Spirits generated in the Brain are not all equally good; and if thoſe which flow to the Eyes were endu'd with bad Qualities, alſo thoſe which flow to other parts, would partake of the ſame bad Qualities, and would badly affect other parts likewiſe, and obſtruct their Performances; for there is no reaſon that worſe ſhould flow to the Eyes, and better to other parts: nevertheleſs in moſt *Ophthalmies*, no other parts are endamag'd unleſs the Eyes. Beſides, there can be no ſuch emiſſion of Spirits from the eyes at a diſtance, as to defile a Looking-Glaſs, or infect the eyes of another perſon at a diſtance. And therefore the defilement of the Looking-Glaſs proceeds not from the contaminated Spirits iſſuing from the Eyes, but from the corrupt Vapors proceeding from the Mouth, or ſome other external Cauſe. Thus Blear-eyedneſs caus'd by looking upon Blear Eyes, whether at a near or farther diſtance, is to be attributed, not to the emiſſion of contaminated Spirits from the Eyes, but to the conturbation of the Spirits of the other Perſon, caus'd by the abhorr'd Spectacle of Blear-Eyedneſs; as being that by which the Spirits are not only mov'd diſorderly; but alſo the Pores being dilated by the unwonted Influx of Spirits more than uſual, the Blood and Humors are haſten'd away in greater quantity to thoſe Parts upon which the thoughts of the Mind are moſt intent, that is to ſay, the Eyes. In the ſame manner as when a Perſon ſees another vomiting, many times his Abhorrency and Squeamiſhneſs is ſuch, that he is thereby provok'd to vomit; or elſe beholding with horror and terror the outragious Motions of Epileptics in their Convulſions, falls himſelf into an Epilepſie; of which there are ſeveral Examples among the Phyſicians; neither of which can be aſcrib'd to Contagion, but to the diſorderly Motion of the Spirits, by which the vicious Humors are alſo hurry'd to the Parts intently thought upon; eſpecially in ſuch perſons where ſuch Humors were already collected and prepar'd in the Body, as the Milky Juice has been brought to the empty Breaſts of Women and ſometimes of Men by Conceit; according to what we have ſaid, *l.* 2. *c.* 2. But in regard this horrible Impreſſion of abominating Conceit is not alike in all People, nor troubles all People actually; beſides that, it does not happen to ſuch Perſons where theſe ſharp and vicious Humors are collected in their Bodies, hence it falls out that the Eyes of ſome are affected with the ſight of Blear-Ey'dneſs, when others are nothing concern'd at a nearer diſtance, and why ſome vomit to ſee another vomit, others are nothing mov'd.

No Inquinations iſſue from the Eyes.

VIII. *Some obſerving theſe Difficulties concerning the Spirits, and yet willing obſtinately to defend Contagion in Lippitude, ſeek another Evaſion, and affirm that this Contagion does not conſiſt in the Spirits ſo much as in certain thin Exhalations and contagious Impurities iſſuing from the Eyes of a Blear-ey'd Perſon*; as the Peſtilence is got by contagious Contaminations; and ſo by reaſon of this ſort of Contagion Lippitude has been known to be epidemic, as they report; and further, that Mirrors have been altogether contaminated and corrupted by the very Looks of ſome who have had thoſe Vapors iſſuing from the Eyes very malignant; inſomuch that *Hoffman* tells a Story of a florid young Virgin, who during the time of her Flowers, ſo infected the Glaſs where ſhe dreſt her ſelf, that the Quickſilver dropt off from behind. But theſe People do not conſider, that very few Exhalations can iſſue from the Eye, which is a colder Part; that beſides its conjunctive Coat, is cover'd with another hard and thick Coat, able to ſhoot themſelves three, much leſs twenty paces; at which diſtance Lippitude has ſometimes been con-

contracted at the ſight of a Blear-ey'd Perſon; for if there ſhould be ſuch a continual Emiſſion, though of the moſt thin Vapors from the Eye, certainly they would be totally dry'd up in a few hours time, nor would that Moiſture which is afforded by the ſmall and almoſt inviſible Arteries, ſuffice to ſupply ſo great an Inanition. Moreover, if any one troubl'd with a deform'd Lippitude, ſhould enter into any ſpacious Court, and another beholding him at a diſtance, ſhould preſently grow blear-ey'd (as we have known it ſometimes happen) ſhall that come by Contagion? Then muſt the Patient have ſent the Contagion before him; elſe it is not likely that the Contagion ſhould ſpread it ſelf from his Eyes through all the Court in a moment of Time. Several People have contracted Ophthalmies from looking upon blear-ey'd perſons, even in the open Air and againſt a ſtrong Wind; and yet no Man can well believe, that ſuch a ſubtile Contagion ſhould be carry'd againſt the force of the Wind. But in the Peſtilence it is quite otherwiſe, where a great quantity of contagious Exhalations are generated out of the moiſt, hot and porous parts of the Body, alſo out of certain contaminated and copious Humors contain'd in the Body it ſelf; from which by reaſon of the extream Heat and Moiſture Exhalations are rais'd in great quantity; and by reaſon of that great quantity, and the force of the great Heat that makes a ſtrong Expulſion, there's no body but will grant that they may be carry'd to a great diſtance. As to Epidemic Ophthalmies, they generally ſpread themſelves, by reaſon of the common Cauſe proceeding from the Air or Diet, but not by reaſon of any Contagion iſſuing from the Eyes; or if contracted by looking upon the Perſon affected, it proceeds from the conturbation of the Spirits aforeſaid. So that if ever any Looking-Glaſſes were defil'd and ſpoyl'd by any contaminations iſſuing from the Eyes, *credat Judæus Apella*, for I will not. Neither does the Story of *Hoffman* prove it; for it is beyond all Belief, that a hard and poliſh'd Looking-Glaſs, which neither Oyl of *Vitriol* nor *Aqua fortis* can penetrate, ſhould be corrupted and ſpoil'd by a few Exhalations proceeding from the Eyes of a Virgin; nay, that thoſe Exhalations ſhould ſo penetrate the Pores of the Glaſs, that the Quickſilver ſhould fall off from the Back-ſide, when thoſe Glaſſes will not admit the moſt ſubtil and ſharp Spirits to paſs through their ſides. Perhaps that Looking-Glaſs might be corrupted by the great quantity of viſcous and foul Vapors exhaling from the Mouth of the Virgin and the reſt of her Body; which contamination alſo might have been eaſily wip'd out with a Clout; ſo that the Quickſilver did not fall off for that reaſon. Rather it is moſt likely, that *Hoffman* being over-credulous, was deceiv'd by the pratling Goſſips that told him the Story and ſhew'd him the Looking-Glaſs, which was not ſpoil'd by that Cauſe, but by the Moiſture of the Wall, againſt which the Glaſs had hung long; only it happen'd that the Quickſilver fell off at the time that the Virgin lookt in it.

By way of Corollary, I ſhall add one thing: If any Contagion iſſu'd from the Eyes of blear-ey'd Men, it would be no leſs catching in the Dark than in the Light, as it happens in the Peſtilence and Itch; but let any one lie with an Ophthalmic perſon, ſleep and converſe with him all Night not knowing him to be ſo, his Eyes ſhall never come to any hurt thereby, though he ſhall preſently catch the Diſtemper by converſing and ſeeing him by the Light. Which is a certain Sign that it does not proceed from any Contagion, but from the Conturbation aforeſaid.

A certain *German* Student going into a Brothel-houſe about Night, and asking for a Whore, was carry'd, as ſhe made him believe, to a very fair Bedfellow, without a Candle in the Dark, pretending that ſhe would by no means be known, becauſe ſhe was another man's Wife; with whom he lay all that Night and ſeveral other Nights afterwards; which not ſufficing, he would often boaſt among his Companions what a lovely Miſtreſs he had got to himſelf. His Aſſociates, underſtanding that he was gone one Night to the ſame Bawdy-Houſe, in the middle of the Night came a great Cluſter of them together, and whether the Bawd would or no, lighting up ſeveral Candles, went up in ſearch of their Fellow-Student, and broke open the Chamber-Door. He, ſeeing his Companions entred, skipp'd out of the Bed, and put on his Cloaths; and ſoon after the Wench was dragg'd out of her Bed to the Light; at what time they found her to be an ugly blear-ey'd Jade, and thereupon jeer'd their Companion, who had never ſeen her before by the Light, almoſt to Death, for bragging as he had done

done of the Beauty of his unknown Harlot. On the other ſide, the poor Scholar who was ignorant of that Deformity in her before, after he had lookt more accurately upon the Strumpet by the Candle-Light, became ſo troubl'd and diſturb'd through his averſion to the Deformity of the Spectacle which he beheld, that he was ſuddenly tak'n with a deſperate Ophthalmy, of which he could hardly be cur'd in a Month's time. Whence it is apparent, that the young Man contracted that Blear-Ey'dneſs through the Conturbation of his Spirits only, and not by Contagion; which otherwiſe he had caught by lying with the deform'd Beaſt ſo many Nights before.

Two ſorts of parts of the eyes.

IX. *In the Eyes there are two ſorts of Parts to be conſider'd; ſome that contain, others that conſtitute and form them.*

The containing Parts are various. The Pits of the Eyes call'd *Orbits*, the Eye lids, with the Brows both lower and uppermoſt, the Caruncles in the Corners. and the Kernels.

The conſtituting Parts are the Fat, the Veſſels, the Muſcles, the Tunicles and Humors.

CHAP. XIV.

Of the Parts containing the Eyes.

See Table 14.

The Orbits

I. *AMong the Domicils of the Eyes, which are allow'd 'em for Security and Convenience, two great Cavities are firſt to be conſider'd, which are vulgarly call'd* Orbits, *hollow'd on both ſides the Noſtrils under the Forehead in the Bones of the* Cranium, *wherein the Supream Architect would have the Eyes to be contain'd, that in theſe Bony Seats they might reſide more ſafe from all external Injuries. Which Bones either hanging over or plac'd under the Eyes, the* Greeks *call* ὑπωμα & ὑποφθαλμια, *as much as to ſay, Sub-ocular.*

The Figure and Largeneſs.

II. *The Figure of the* Orbits *is round and ſomewhat oblong; the Largeneſs but moderate, no more than ſufficient for the Eyes with their Kernels, Fat and Muſcles to be contain'd therein, and mov'd with freedom.*

The Coats.

III. *They are cloath'd withinſide with the* Pericranium, *which* Riolanus *denies, contrary to Ocular Teſtimony, to which the Fat and Beginnings of the Muſcles cloſely adhere.*

Their holes

IV. *In each there are three Holes; two behind, and thoſe the biggeſt; and one upon the ſide, which is leſs.* The innermoſt of thoſe behind affords a paſſage to the Optic Nerve. The outermoſt plac'd at the ſide of it, is an oblong Fiſſure, through which the moving Nerves with the Arteries and Veins proceeds to the Eye. The Lateral Hole, which is leſs, is ſeated in the inward Angle. This under the Sieve-like Bone, is bor'd through to the inner parts of the Noſtrils, and ſends forth Tears; therefore vulgarly call'd the *Weeping-Hole.* Concerning this Hole *Spigelius* makes this Obſervation, that it is bigger in Women, who are apt to ſhed Tears, than in Men, and in ſuch as are not ſubject to weep.

Now that the Tears may not flow continually through theſe Weeping-Holes, the Supream Architect has plac'd on each ſide a ſoft and kernelly Caruncle furniſh'd with ſmall ſanguineous Veſſels and Nerves almoſt inviſible, as alſo with two ſmall little Veſſels carrying the *Lympha*, proceeding from the inner part of the Glandulous Fleſh, and inſenſibly pouring forth Liquor continually to moiſten the Eyes. This Glandulous Fleſh covers the weeping-hole; hence by ſome call'd the *Lachrymal Caruncle*, and ſo prevents the continual Efflux of the internal Liquor; till preſs'd by its over-abounding quantity, it gives way a little, and ſo affords a Paſſage to the Liquor, which is the Tears. This Caruncle being overmuch contracted by the cold Air, or eaten away, or exulcerated by ſome ſharp Humor, it happens that the ſaid Hole is not exactly ſhut; whence happens a continual and unvoluntary emiſſion of Tears.

At length, between the Ball of the Eye, cover'd with the Eye lids, and the lower Region of the Eye-brows and the upper Region of the Cheeks, two ſemi-

lunary

lunary Cavities come to be consider'd; of which the uppermost by the *Greeks* is call'd Κοίλον, by the *Latins*, *Oculi Cavum*, or the Hollow of the Eye. Both these Cavities, upon much watching and Ophthalmic Distempers, but more especially in a Flegmatic Cachexy and the Dropsie, are wont to swell, and to look somewhat black and blew. Which Colour if it be pale and remarkably shining, is a certain Sign of the French Disease.

A Sign of the French Disease.

The Eye-lids.

V. *The Eyes contain'd within these* Orbits *or strong Dens, for their better preservation are cover'd with the Eye-lids, as with Curtains, to keep out Dust, troublesome Smoak and Vapors, as also the Excess of Light and the Injuries of the Air, and is moisten'd, wip'd and cleans'd by the Corneous Tunicle to render the Sight more bright and clear.*

They consist withoutside of a thick Skin, under which there is no Fat; withinside they are invelopp'd with a thin and slender *Pericranium*, to facilitate their Motion. Between these Parts runs a Fleshy Membrane, which is here very thin.

The Vessels.

VI. *They receive very small Branches of Arteries from the* Carotides, *and send forth diminutive Veins to the Jugulars, and are furnish'd with little Nerves from the second Pair.*

In each Eye there are Two; one lower and lesser, whose Motion is slower in Man; this in Birds is bigger than the uppermost; and in most seems to be mov'd for the most part alone.

Muscles.

VII. The other, which is uppermost, is indu'd with a most swift Motion, *which it derives from two Muscles.* Of which the first, which is streight, seated in the upper Region of the *Orbit*, rising with a slender and gristly beginning within the Chamber of the Eye, above and close by the Elevator of the Eye about the Hole of the Optic Nerve, is extended with a broad and subtil Tendon to the brim of the Eye-lid, and raising it up, opens the Eye. The other, call'd the *Orbicular Muscle*, is seated between the Fleshy Membrane, and that which is drawn forth from the *Pericranium*. This by most Anatomists is describ'd as one Muscle, orbicularly encompassing the Eye; which about the breadth of a finger, arises in the larger Angle or Corner, at the Root of the Nose, and thence proceeds under the lower Eye-lid, and runs back with orbicular Fibers through the outer *Canthos*, and returns above the upper Eye-lids to the same place of the inner *Canthus*, where it ends, and by contraction shuts the Eye-lids. But *Spegelius* and *Riolanus* more truly aver, that this orbicular Muscle is not single but double; because that in Persons that are full of Muscles, two slender semicircular Muscles are commonly observ'd; of which the uppermost and largest is seated in the upper Eye-brow, and rising with an acute beginning out of the inner Corner of the Eye, and that part of the Eye-brow next the Nose, and so carry'd transversly on to the outermost Corner, and inserted into it, takes up all that space which lies between the Eye-brow and the extream part of the Gristle out of which the Hairs grow. The lower and lesser, arising from the side of the Nose with an acute beginning, and carry'd athwart through the lower Eye-lid, and somewhat ascending to the outer Corner, is inserted into the upper Eye-lid with a broad end. And thus both these Muscles have their distinct Insertions and Beginnings, though their circular Fibers touch one another, and stick so close together, so that upon a slight view, they seem to be but one Muscle; though it be apparent that they are two, not only by accurate separation and demonstration, but also from hence, that each of them receive distinct Nerves from distinct places, that is to say, the uppermost, a little Nerve from the moving Nerve that breaks forth thro' the Hole of the upper *Orbit*. The lowermost, another little Nerve from that Nerve which extends it self through the Hole of the lower part of the *Orbit*. The same also appears from hence, that Physicians have observ'd in the Cynic Convulsion of the Face, that the lower Eye-lid has remain'd immoveable, and as it were drawn downward, while in the mean time the upper has mov'd naturally; which could never be if both Eye-lids were mov'd by one Muscle.

The Ciliar Muscle.

VIII. *To these Muscles aforesaid, some add a Ciliar Muscle; which girdling the Hairs of the Eye-brows, assists in the exquisite joyning of them together.* But this Muscle is not easily demonstrated by any Man; for which reason many deservedly question whether there be any such Muscle or no?

What is the Motion.

IX. *As to the Motion of the Eye-brows, there is some Dispute between* Aristotle *and* Galen, *while the one affirms*

affirms their Motion to be natural, the other voluntary. But *Ariſtotle* err'd out of his Ignorance of thoſe Muſcles: the other knowing the Muſcles, rightly aſcribes a voluntary Motion to them.

Julius Caſſerius, obſerving that the Muſcles of the Eye-lids are extreamly ſlender, yet though ſo ſlender, that they are not wearied by continual Motion, grants that the Motion of the Eye-lids is voluntary, but ſomewhat different from the common voluntary Motion, as if he thought that they were partly mov'd by a voluntary Motion; or that their Motion was compoſed of natural and animal. But had he ſeriouſly conſidered the lightneſs of of the weight of the Eye-lids, he would have been convinc'd that thoſe thin Muſcles were ſufficient to perform their voluntary Motion.

Obſervations taken from the Eye-brows.

X. *Julius Caſſerius* takes alſo theſe Obſervations from the Eye-lids: for Example, that ſuch as have their uper Eye-lid elevated, are proud and fierce; but that ſuch as have it depreſſed, ſhutting almoſt half the Eye, ſo that they ſeem to look down upon the Ground, are humble and mild. But *Hippocrates* takes a very bad Prognoſtic from Eye-lids, ill joyned in Sleep. *Conſider*, ſays he, *what is to be ſeen in the Eye in time of Sleep; for if any thing of the White appear, the Eye-lids being not cloſs'd (if it do not happen from looſneſs, or the drinking of ſome Potion, or that the Patient were not wont to ſleep ſo) 'tis an ill Sign, and deadly.*

Canthi.

XI. *The Eye-lids open from two Angles, which are vulgarly called* Canthi, *which the Greeks call* τῶν ὀφθαλμῶν κανθὸς. Of theſe two, the outward Corner is leſs, to which there alſo joyns a remarkable Kernel within the *Orbit* of the Eye, which they call the Kernel *without a Name*, which is ſeated in the upper Region of that Corner, thicker above, thinner below, and as it were neatly diſtinguiſh'd into certain Lobes, and ſending forth ſmall Lymphatic Veſſels between thoſe Lobes, which running forward within the inner Tunicle of the Eye-lids, pierce it through with ſmall Holes, at a ſmall diſtance from the Hairs. Theſe little Veſſels *Nicholas Stenonis* firſt diſcovered in the Head of a Sheep and Calf; and it is probable that it is ſo in the Eyes of a Man, though not diſcernable to the Eye, by reaſon of their Exiguity. He alſo tells us the way how to find out thoſe Veſſels. *The Mouth of thoſe Rivers*, ſaith he, *are eaſily diſcovered, if you extend never ſo little the whole Eye-lid in the outermoſt Corner. For then about half a Thumbs breadth from the outward Limbus, you ſhall meet with three in the Angle it ſelf, four below, and ſix, ſometimes ſeven above, through which a Briſtle being thruſt in without Diſſection, you ſhall eaſily find a Paſſage into the Kernel it ſelf. The laſt year diſcovered theſe Veſſels to me, when holding to the Light of a Candle the Eye-lid of a Sheep, after I had pluck'd out the Eye out of the Orbit, to ſee whether it were tranſparent or no; at what time the ſhining Rivulets of the* Lympha *clearly betray'd themſelves.*

The innermoſt Canthus.

XII. *The innermoſt* Canthus *is bigger (particularly called by the* Greeks ἐγκανθὶς, *and by* Heſychius μυὸς *a Fountain, as ſeeming to be the Fountain from whence the Tears iſſue) in which the Glandulous Caruncle aforeſaid, lyes upon the Lacrymal Hole.* Which being corroded away by the Acrimony of ſharp Humors, then the Eye weeps without any conſtraint; which is the cauſe of that Diſtemper which the Phyſitians call the Lachrymal Fiſtula, the *Greeks* αἰγίλωπα.

In the Eye of an Ox, beſides this Caruncle, there is to be found a certain brawny hard Particle, ſmooth toward the Eye, on the outward part ſomewhat rough, affording a more eaſie Motion to the Membrane, by which the Eye twinkles.

The Cilia.

XIII. *Little ſoft Griſtles lace the Extremities of the Eye-lids, which the Greeks call* τρίχες, *the Latins* Cilia, *for the more ready Expanſion and exact Cloſure of the Eye-lids.* Of which, the uppermoſt is much broader than the lower.

The Lachrymal Points.

XIV. *Within theſe Griſly* Limbus's, *about the larger Corner two ſmall Holes are obvious in each Eye, called the Lachrymal Points, admitting a Hoggs Briſtle within the Membranes of the Eye-lids, more conſpicuous in Oxen, and other large Animals than in Men.* Theſe cloſe together into one Channel near the Lachrymal Hole, which running forth towards the Foreparts, opens with a manifeſt Hole about the Extremity of the Noſtrils, through which that thin Liquor diſtils, eſpecially in cold Weather, when Men drop at the Noſe before they are aware. And ſometimes through theſe Lachrymal Points, ſome ſmall quantity of the Lymphatic Liquor, ſqueez'd out of the

Kernels, flows forth like Tears without any compulsion, which gave them the Name of Lachrymal Holes, though they are not really the Fountains of the Tears.

In the Extremities of the Eye-lids, under the upper, is inserted a row of streight Hairs, turning somewhat upward; by *Hippocrates* call'd βλεφαρίδες which *Casserius* and others call particularly *Cilia*, which grow to a certain length, set thin by Natures Law, which they never exceed. They are always also black, and never grow grey, like the rest of the Hairs of the Body; nor do they ever shed but in virulent Distempers of the Part, as the Elephantiasis, or the Pox. Yet *Aristotle* affirms, that they fall off from Men that are extreamly addicted to Venery.

These keep off from the Eyes little Bodies flying in the Air, and render the Sight more perfect, by slightly darkening the Eye; for that if they be wanting through any Distemper, or other Cause, the Eye never discerns so exactly at a distance: but if by any Accident they are turn'd toward the inside of the Eye, they become cruelly troublesome and hinder the Sight.

In Oxen, besides the Eye-lids, there is yet another Membrane under the Eye-lids, which both Men and most Animals want, which is govern'd by a peculiar voluntary Motion. For it is drawn with a double String to the opposite Corner, the one lying hid above, the other below, which arises from a certain Muscle plac'd in the outer Corner; which Muscle, by *Fallopius*, is taken for part of that which draws the whole Eye to the outward Parts. By the benefit of this Muscle Oxen twinkle, and can shut their Eyes, the Eye-lid being still open, when they fear, least any thing should fall into the Eye.

The Eye-brows.

XV. *For more security, above, upon the Confines of the Fore-head and Eyes, the Eye-brows are placed, hanging over like a Bow, with a thicker Skin, and rough, with the Hair lying pressed down toward the outward Parts, to receive Sweat, Dust and other things that fall from the Head, least they should slip into the Eyes.*

These Eye-brows, by the Greeks call'd ὀφρύες, *Ruffus* calls the hairy Extremities of the Fore-head, and that part of them which looks toward the Nose, is call'd ὀφρύων κεφαλαὶ, the Head of the Eye-brows; the other regarding the Temples ὀφρύων οὐραὶ, the Tail of the Eye-brows. The middle space between both Eye-brows, in Greek μετόφρυον, by the Latins, because it is smooth and void of Hair, is call'd *Glabella*: Though sometimes that part be also hairy; the Eye-brows meeting together at the Extremity of the Nose, which *Aristotle* observes to be the Sight of a Person σκυθρωπὸς, austere and morose, and such a Man is therefore by him call'd συνόφρυς.

CHAP. XV.

Of the Tears.

I. HAving made mention in the former Chapter, of the Passages through which the Hairs flow, in regard the Tears themselves, together with their true Fountain, have been but obscurely hitherto describ'd by the Philosophers; we thought it would not be time ill spent, by making a short Digression to insert into these Anatomical Exercises a more exact Discourse concerning them, that whence those serous Drops distil, and what they are, may be the better understood.

As to the original Causes and matter of Tears, Opinions are very various.

II. *Empedocles*, as *Galen* testifies, imagined that Tears were generated out of attenuated and melted Blood. But in regard that many men can weep of a suddain, and when they please, it is not probable that the Blood can be so suddenly melted.

III. *John Baptista Scortias*, will have Tears to be generated in the Corner of the Eye, from the Animal Spirits, which being compos'd by the Apprehension of something sad, is melted, and distils into Tears. Of the same Opinion *Jacobus Tappias* seems to be, who writes, that as Urine and Sweat are Excrements of the veiny and arterious Blood, so Tears are the Excrement of the nervous Blood, that is to say, the Animal Spirits. But in regard that only invisible Animal Spirits, and no visible serous Humors can pass through the narrow Pores of the Nerves; seeing also that Tears flow out at times of great Joy and Laughter, when there is no sence of any Saddess; lastly, seeing that so great a quantity of Tears, as in a short time issues forth in extraordinary Grief, would destroy the whole Frame of Man, if so vast

vaſt a quantity of Animal Spirits ſhould be waſted in their ſupply; it is apparent that Opinion can no way be defended, as being far from Truth.

IV. *Georgius Nyſſenus* and *Moletius* thought Tears to be generated out of many Vapors carried to the Head through ſome Conturbation of the Bowels, and there condenſed into Water by the coldneſs of the Brain, which is afterwards expell'd forth as an unprofitable Excrement. Neither does *Coringius* ſeem to differ much from their Opinion. But in regard that many ſhed Tears in great abundance, upon the ſight of a ſad Accident, no Conturbation of the Bowels preceding. Nay, ſeeing that many times Tears proceed from riding againſt the cold Air, or by looking and gazing ſuddenly upon the Sun, without any Conturbation of the Mind or Bowels; ſeeing that others weep when they pleaſe, and that Vapors cannot ſo ſuddenly aſcend to the Head, and be condens'd ſo ſoon, and in ſo great a quantity, ſeeing that the Heart being troubled and poſſeſſed with extraordinary Grief, together with the Brain and other Bowels, and yet the Perſon grieved never ſheds any Tears; ſeeing that Tears flow as well in Joy as Sadneſs, but the Vapors cannot be carried to the Head in the ſame equal manner and quantity, nor with the ſame ſwiftneſs in theſe contrary Affections of the Mind, it is plain that this cannot be the Original of Tears.

Ariſtotle alledges Tears to be a certain Sweat or Vapour: But what ſort of Sweat, and where generated, *Carteſius* more at large explains. *For*, ſaith he, *That their Original may be the better underſtood, it is to be obſerved, that though many Vapors continually exhale from all Parts of our Body, yet there is part, out of which more iſſue forth than out of the Eyes, by reaſon of the Bigneſs of the Optic Nerves, and the multitude of the ſmall Arteries, through which they come thither.*

VI. But theſe things are to be examin'd a little more ſtrictly; *Carteſius* ſays, there is no part out of which the Vapors iſſue forth in more abundance than out of the Eyes. But it is poſſible that more Vapors ſhould iſſue forth from thoſe parts which are encloſed and enfolded, beſides other Membranes with a ſcherotic hard and thick Tunicle, and ſo compact and void of Pores, that there is not the like in the whole Body; I ſay, Is it poſſible that more Vapors ſhould iſſue forth from this than from any other parts, among which there are a thouſand ten times hotter, moiſter and more Porous? Is it becauſe of the largeneſs of the Optic Nerves that there is ſuch a Conflux of Vapors to the Eyes, and yet the Sight no way darkned thereby, nor the Ingreſs of the Animal Spirits no way obſtructed? Whatever flows through their larger innermoſt Poroſities, muſt be depoſited in the innermoſt Cavity of the Ball between the Humors, and ſo of neceſſity the Balls of the Eyes could not chuſe but ſwell, and the Sight be very much endamaged. As to the multitude of diminutive Arteries, that is not obſerv'd to be more numerous in the Eyes than in many other parts, for few ſmall Arteries run to the Eyes, and thoſe ſo ſlender, that they are ſcarce to be diſcern'd; ſo that ſo great a quantity of ſerous Humors cannot be pour'd forth out of thoſe inviſible Veſſels, to moiſten a whole Napkin with Tears in the ſpace of one hour. If any one ask why that Vapour does not always and continually flow and beget Tears, *Carteſius* anſwers, *That the Vapors of the Body are only chang'd and condens'd into Water, when they are leſs ſtir'd than is uſual, though they are not ſo copious; or when they are more copious, ſo that they be not exceſſively agitated.*

VII. Now let this moſt famous Perſon tell me, where is the leſs motion of the Vapors, or the greater quantity; whether in the Man that ſheds them for Joy or for Sorrow. If he ſays, that in Sorrow their Motion is leſs, I will aver that in Joy there is not a greater quantity; becauſe theſe Affections in the ſhorteſt Interval then befall the ſame Man, whereas in Gladneſs, at the ſame time, it ought to be occaſion'd by a greater quantity; for he himſelf tells us it cannot be done by the greater Motion, which happens in Gladneſs. If on the other ſide, he affirms that there is a leſs quantity of them in Sadneſs, I will aſſure him that the Motion is greater in Gladneſs, which according to the Words of *Carteſius*, obſtructs the ſhedding of Tears; nevertheleſs in the mean time, there is not a greater abundance of Vapors to be ſo ſuddenly encreas'd in the ſame Perſon, and yet that very ſame Perſon, in a ſhort interval of time, ſheds Tears during both theſe contrary Affections of the Mind, and therefore not from the Cauſes already related. Theſe Difficulties *Carteſius* eſpying afar off, chooſes rather to add other Cauſes of this Accident. *Moreover*, ſays he,

I cannot obſerve any more than two Cauſes, why the Vapors that proceed from the Eyes ſhould be changed into Tears. The firſt, when the Figure of the Pores, through which they paſs, is alter'd, by ſome Accident, &c. *The other is Sadneſs, ſucceeded by Love and Joy,* &c.

VIII. Shall there be then the ſame Figure of the Pores in theſe ſame contrary Affections, Sorrow, Love, and Joy? I may add in Laughter alſo, ſwift Riding, or when Duſt, or any other thing falls into the Eyes; alſo in Infants, grown People, or aged Perſons? Or would *Carteſius* rather diſtinguiſh between the next Cauſes, that the certain Figure of the Pores ſhould be one thing, Sadneſs another, Love another? Theſe things are very repugnant one to another; for thus, one next Cauſe of Tears is divided into ſeveral, and thoſe contrary to each other. He that more attentively weighs theſe things, ſhall find that the moſt acute *Carteſius*, in his Diſcourſe of Tears, as well as other Men, was in a great Doubt, and very far from the Mark. Which however was no Fault in the chief Philoſopher of our Age, ſeeing there is no Man ſo perſpicuous that may not err in ſome things.

IX. From the aforeſaid Opinion, *Aquapendens* and *Caſſerius* very much differ, who affirm Tears to be a thin Excrement of the Eyes themſelves, generated out of the remainder of the proper Concoction, gathered together in the Fat and little Kernels. With theſe *Septalius* agrees, writing, that Tears are a ſerous Humor diligently generated in the Eyes, and collected together in their four Kernels. But neither do the Eyes diſcharge ſuch a quantity of Excrement, nor generate ſo much ſerous Humor. Neither can ſo large a quantity be gathered together in ſmall diminutive Kernels, not able to contain above eight or ten Drops, nor in a ſmall quantity of Fat, which by reaſon of its oylineſs will not imbibe any *Serum*, ſo as to moiſten whole Handkerchiefs with Tears. Neither can ſuch a quantity be collected without a viſible Tumor and Inconvenience to the Sight, in the ſmall Kernels and Fat before mention'd: whereas before the ſhedding of the Tears, there is no ſwelling of the Kernels or Fat to be perceiv'd. Beſides, there is no reaſon why that Excrement ſhould be generated in Grief and ſudden Sorrow ſo ſpeedily, or ſuch a quantity be collected together, to burſt forth into Tears.

X. Some few were of Opinion, that Tears were a Portion of the Potulent Humors contain'd in the Brain and Veins of the Eyes, and more eſpecially in the Veins of the Corners of each Eye, which burſts forth upon the Compreſſion or Dilation of thoſe Veins, occaſion'd by much Joy or Sorrow. But the narrowneſs and ſmall number of thoſe Veins hereby diſcernable, contradict this Opinion, together with the vaſt quantity of the Lachrimal Humors, which cannot be collected to that Abundance in thoſe diminutive Veſſels, and flow forth in ſo large a quantity; nor can it be ſo ſuddenly tranſmitted to them, nor paſs through them. Add to this, that the little Veins of the Eyes, take in at their Extremities the ſuperfluous bloody Humors, and carry them to the Jugulars, but pour none out from themſelves, becauſe there is no paſſage for that potulent Matter to come to the Eye.

XI. Nor do they differ much from the foregoing Opinion, who believes the Tears to be nothing elſe but the *Serum* which is ſeparated from the Blood, which is carried to the Head, when the Pores are ſo diſpoſed by a certain Motion of the Spirits, that it may be able to burſt forth. But they neither tell us what that Diſpoſition is, nor that ſame certain Motion of the Spirits; which two things, in regard they are ſo extreamly different and multificacious, and cannot be naturally the ſame, as well in Conſtriction as Dilatation, in Sadneſs as in Joy, in which contrary Accidents, however Tears muſt flow from one and the ſame next Cauſe, and not from diverſe and contrary, there is nothing remains that can defend that Opinion.

XII. At this day many aſcribe the Flux of Tears only to the Lymphatic Veſſels carry'd to the Eyes. Yet never any Perſon that I know of has hitherto demonſtrated that manner of Lachrymation, nor thoſe Veſſels themſelves; beſides *Nicholas Stenonis*, that moſt accurate Deſcriber of Kernels, who lately going about to explain that Opinion more at large, not without reaſon, affirms them to be a Serous ſort of Liquor, chiefly ſeparated from the Arterious Blood, but as to the manner and place of Separation, his Opinion is quite different from what any body has hitherto propounded. For he believes that the Blood is carried through the Arteries into the Glandules of the Eyes, and that the Superfluity of it is ſuckt up by the Veins. But that the Veins, if they

they be ſqueez'd together by any Cauſe, do not perform that Office ſufficiently, and then by reaſon of the long ſtay of the abounding Blood in the Glandules, the *Serum* is ſeparated from it in greater quantity, and flows in the form of Tears through the Lymphatic Veſſels proceeding from the Kernels. Then he believes the Veins to be compreſs'd by the ſwelling of the Glandules, cauſed by a more copious Influx of Animal Spirits, which creeping into the Glandules through the diminutive Nerves, at the diſpoſal of the Mind, as in Grief, Anger, Joy, Sadneſs, flow ſometimes more, ſometimes fewer into the Kernels, more than after a various manner, and ſtreighten them more or leſs. To this cauſe he refers thoſe Tears that are ſhed contrary to Inclination, as alſo thoſe which proceed from Fumes and ſharp Vapors, or break forth upon any violent motion of the Body; and farther, believes his Opinion to be mainly confirmed by the burſting forth of bloody Tears, which are ſometimes obſerv'd. Certainly this new Opinion is propounded very ſpeciouſly, but in the mean time it does not ſufficiently diſcover the Fountain of Tears. For if we compare the great quantity of Tears ſo ſwiftly burſting forth with the diminutive Blood-bearing Veſſels of thoſe Kernels, preſently this Opinion will fall to the Ground at the very Threſhold. For how few, and how ſmall are thoſe little Arteries which are carried to the Kernels of the Eyes? The moſt of them are inviſible. Therefore, though in the time of Sadneſs, all the Veins of thoſe Kernels which would carry back the Blood, ſhould be altogether obſtructed, and all their little Arteries open'd by a Solution of the *Continuum*, and out of theſe, not only the Serous Part of the Blood, but all the Blood that was contain'd therein and carried through them ſhould burſt forth, they would not be able to pour forth the hundredth part of ſuch a quantity of Liquor in a whole hour, as often in great Sadneſs is wept out in Tears in the ſpace of one ſingle quarter of an hour. If it be anſwered, that in the time of Sadneſs the Blood is carried in greater quantity to the Eyes, and that the ſaid Kernels ſwell and are more compreſs'd, and the Veins ſtreightned, Reaſon will teach us the contrary. For in Sadneſs the Pulſe of the Heart and Arteries is little and contracted, and the exterior Parts wax cold; becauſe the Heart ſends from it ſelf much leſs Blood into any of the Arteries, much leſs into thoſe of the Head. Neither is there any reaſon why in Sadneſs it ſhould be carried in greater quantity, and more ſerous to the Kernels of the Eyes than to any other Parts; Moreover, the little Arteries of thoſe ſmall Kernels, are too few and too narrow for ſo great a quantity of Blood and *Serum* to paſs through them in ſo ſhort a time, as is ſo ſwiftly wept out in Tears. Laſtly, there is nothing to cauſe thoſe little Kernels more to ſwell or be compreſſed in time of Grief, than at other times.

For as to thoſe Animal Spirits, which as *Nicholas Stenonis* aſſerts, flow forth at the Diſpoſal of the Mind. Sometimes more, ſometimes fewer, as in Grief, Anger, Joy, *&c.* and move the Kernels after a various manner, we grant that they enter the Kernels in a ſmall quantity, through thoſe diminutive, few, and for the moſt part, inviſible Nerves, moderately to ſeparate the ſaltiſh ſymphatic Liquor from the Arterious Blood, and pour it forth through the ſmall Veſſels deſcrib'd in the foregoing Chapter, for the neceſſary moiſtning and ſmoothing of the Eyes; but not in ſo great a quantity as to move the Eyes, and cauſe them ſo ſwiftly to ſwell, or to compreſs them, and ſo to ſqueeze out ſuch a quantity of Tears. For by the Influx of thoſe Animal Spirits, hardly any other Parts are mov'd, at the diſpoſal of the Mind, then the Muſcles, and ſuch parts as are mov'd by the Muſcles. Add to this, that in Sadneſs the Animal Spirits flow in leſſer quantity than is uſual, to any parts whatſoever, which is the reaſon that the Joynts often tremble, and the Sight of the Eys is darkened. For the Heart contracting it ſelf, and beating but weakly, as in Sadneſs, little Blood is ſent to the Brain to encreaſe their Generation, and withal, the Motion of the Brain it ſelf being thereby weakned, it ſends forth fewer Animal Spirits to the reſt of the Parts. Laſtly, though we ſhould grant what that Famous Gentleman aſſerts, his Opinion is not thereby confirm'd, but quite overturn'd. For thence it follows, that the more copious thoſe Animal Spirits are that flow into thoſe Kernels, ſo much the more would be their Swelling and the Compreſſion of the Veins, and thence a greater Effuſion of Tears; but in Joy, the ſaid Spirits flow in great plenty to the Parts, and yet in Joys, Tears are very rarely ſhed, or if they do burſt forth, 'tis but in a very ſmall quantity. Contrary to this, in Sadneſs, fewer Animal Spirits flow into the

the Parts, whence there muſt a be leſs Swelling and Preſſure, and yet Tears burſt forth in greater quantity. Laſtly, if it be objected that the Salival Liquor may be ſeparated in ſufficient quantity, out of the Arteries through the Kernels, and therefore the Lachrymal Juice. I anſwer, that the *Parotides* and Kernels of the Jaws are remarkably large and very numerous, and furniſhed with many and more remarkable Arteries, ſo that a more plentiful ſeparation may more eaſily be made through them, then through the ſlender and incomparably fewer Glandules of the Eyes, endued with few and almoſt inviſible little Arteries. He therefore that more conſiderately weighs theſe things, will eaſily obſerve, that the Opinion of *Nicholas Stenonis* does not contain the true Cauſe of Tears, and that unwilling Tears can never be deduc'd from it; nor thoſe which are occaſion'd by ſwift Running, Smoak and Duſt, *&c.* nor bloody Tears, which proceed rather from ſome Corroſion of the little Arteries and Veins, which by reaſon of the narrowneſs of the Veſſels can burſt forth but in ſmall quantity.

XIII. Thus have many Men ſtrangly miſtaken the Fountain of this ſame *Lympha*, and while they endeavour'd to diſcover it, have fill'd much Paper with Conjectures. Now let us try whether we can contribute any Light to a thing that lies veil'd under ſo much Obſcurity.

Which before we undertake to perform, we think it neceſſary to diſtinguiſh between the Lachrymal Humors and that ſame Lymphatic Humor which is poured forth out of the Glandules through the Diminutive Lymphatic Veſſels for the moiſtning of the Eyes and ſmoothing of the Parts. For this is the difference between them, 1. This is more lympid and thinner than the other. 2. This flows out of the Lymphatic Veſſels of the Glandules, the other from the Ventricles of the Brain. 3. This is neither ſo ſharp nor ſo ſalt as Tears are found to be, both by the Taſt and their Corroſion. 4. There is but a ſmall quantity of this, nor does the quantity of it offend the Eyes, as Tears does, which burſting forth in great quantity, many times very much prejudice the Eyes. 5. This does not corrode at all, but is grateful to the Eyes, whereas many times Tears corrode the Cheeks, and many times conſume the Glandulous Lachrymal Caruncles themſelves, ſeated in the Corners of the Eyes, which being eaten quite away with their little Veſſels, the Flux of Tears would ceaſe or ſtop, if the forementioned Opinion of *Stenonis* were true, whereas on the Contrary, the Flux is then more unvoluntary, and in greater quantity not to be ſtop'd.

XIV. This Diſtinction thus premis'd, we come to ſpeak of the Tears themſelves, beginning with their Definition.

Tears are the more thin and ſerous Particles of the Flegmatic Humors Collected in the Brain, flowing from the innermoſt Parts of the Eyes.

The Cauſes of the Expulſion of thoſe Serous Particles through the Lachrymal Holes are five.

1. The Plenty of Flegmatic Serous Humors collected in the Brain.

2. Their ſuddain Colloquation, or violent Agitation.

3. The Contraction of the Brain and its Membranes.

4. The inſufficient Covering of the Lachrymal Hole by the Glandulous Caruncle.

5. The Obſtruction of the Spungy Bones in the Noſtrils.

And of theſe Cauſes, for the moſt part, two or three concur; and therefore we muſt particularly explain how thoſe Tears burſt forth in divers caſes.

Tears in Sadneſs.

XV. *In Sadneſs, the Membranes of the Brain, together with the Brain it ſelf, are contracted, and hence the Serous Humors of the Arterious Blood, which gain ſomething of Viſcoſity from the Humid and Viſcous Bowel, are preſſed forth out of the Kernels of the Cortex and the Subſtance of the Brain it ſelf, and Pituitous Kernel, and the ſmall Glandules interwoven with the Choroid Fold, into the Ventricles, and out of them through the Papillary Proceſſes, and the Narrowneſſes of the five repreſenting Bones, into the ſpongy Parts of the inſide of the Noſtrils; which not being able to paſs through them, by reaſon of their quantity and viſcouſneſs, the more thin and ſerous Particles burſt forth through the narrow lateral Lachrymal Holes into the larger Corners of the Eyes, and waſhing the Bodies of the Eyes, and breaking forth, make Tears. But the thicker and more viſcous*

Parti-

Particles, cauſing an Obſtruction in the Spungy Bones of the upper Parts of the Noſtrils, are evacuated by degrees, as well through the Noſtrils as through the Palate. And the leſs that Obſtruction of the Noſtrils grows, the leſs becomes the Flux of Tears; for that being remov'd, the thinner and more ſerous Humors deſcend directly to the Palate and Noſtrils, neither is there any neceſſity, that then they ſhould be preſt forth through the Lachrymal Holes, by reaſon of the Paſſage being ſtopt, ſo that then the Flux of Tears ceaſes, till by reaſon of new plenty of deſcending Humors, a new Obſtruction happens.

In the Murr and Sneezing. XVI. *By reaſon of the ſame Obſtruction Tears frequently burſt forth in the Murr, and ſometimes upon violent Sneezing.*

In Laughter. XVII. *There is the ſame reaſon for Tears that break forth in violent Laughter*: for from that alternate Contraction of the Muſcles of the Head, as alſo of the Brain and its Membranes, the aforeſaid ſerous Humors burſt forth in great quantity out of the Brain and Kernels aforeſaid into the Ventricles, and out of them into the Mamillary Proceſſes; which Humors flow down to the Noſtrils and Palate, and by reaſon of their thicker Particles, cauſe an Obſtruction in the fungous part of the Noſtrils. Which is the reaſon that then the thinner and more ſerous Particles, their free Deſcent being ſtopp'd, burſting forth through the Lachrymal Holes, flow from the Eyes, and that ſo much the more eaſily, by how much thoſe Holes are ſo much the leſs exactly ſhut by the Glandulous Caruncles that lye over them. Hence it comes to paſs, that according to the cloſer or looſer ſhutting up of thoſe Holes, and the more or leſs plenty of Flegmy Humors abounding in the Brain; ſome People ſhed Tears when they laugh, and others not; and becauſe that Concuſſion of the Body, or alternate Contraction does not laſt long, hence it comes to paſs, that People do not ſhed many Tears when they laugh.

Tears in Sadneſs. There is the ſame reaſon why young and ſtout Men, who are not eaſily diſturb'd with Grief, nor have their Brain contracted, beſides that, the Glandulous Caruncle that covers both Lachrymal Holes is ſtronger and larger, ſeldom or never weep. On the other ſide, Old People, Infants and Children, eaſily ſhed Tears, becauſe that in the one, the Glandulous Caruncle is drier, more unequal, and more contracted; in the other ſofter and leſs firm, and ſo weakly covering the Lachrymal Hole, that it gives way to the leaſt violence of the Internal Serous Humors, and ſo procures an immediate Paſſage for the ſaid Lachrymal Humors. To which we may add another Humor, that both the one and the other are ſubject to Grief, that ariſes from Irkſomneſs, Love, or Anger; by reaſon whereof the Brain contracting its ſelf with its Membranes, preſſes forth the pituitous and ſerous Humors, and expels them through the Sieve-repreſenting Bones. *Carteſius* alledges another Cauſe of this Matter, but not ſo true, for he aſcribes the whole thing to the plenty of Blood, from whence ſeveral Vapors are carried to the Eyes. But this Opinion has been ſufficiently refuted already.

Now to tell you how it comes to paſs, that ſome weep upon vehement Motion, or the riding of ſwift Race-Horſes, of this there are three Cauſes. 1. Becauſe the Glandulous Kernels being mov'd from their Places by the violent Motion, do not exactly cover the Lachrymal Holes. 2. Becauſe thoſe Caruncles are contracted by the troubleſome Reverberation of the cold Air. 3. Becauſe thoſe pituitous Humors through violent Agitation flow eaſily from the Head, and deſcend in a greater quantity than uſually through the Sieve-like narrow Paſſages. And the ſame thing alſo happens when the Glandulous Caruncles of each *Canthus* being contracted by the greater Cold of the Air alone, eſpecially if ſuddain, the Lachrymal Holes are not well covered, and therefore give a free Paſſage to the Tears.

Onyons Muſtard, &c. XVIII. *Onions, Muſtard, Errhines, and Sternutories provoke Tears*, by reaſon that through their attenuating and cutting Acrimony, the Humors in the Head are properly attenuated, and rendred more fluid. Properly the Brain, with its Membranes, contracts it ſelf, by reaſon of the troubleſome Vellication that twinges the Eyes and Noſtrils; and by that means preſſes forth and expels the pituitous Humors contain'd therein, which glide the more eaſily through the Lachrymal Holes, becauſe the annate Tunicle of the Eye, and the Glandulous Caruncles that cover the Holes, being twing'd by the ſame Acrimony, are alſo contracted, and ſo give free paſſage to the deſcending Humors.

XIX. *Duſt,*

From Pain in the Eye.

XIX. *Duſt, Straws, Smoak,* &c. *that pain the Eye, are alſo the Cauſe of ſhedding Tears*; becauſe that upon the twinging of the Conjunctive Tunicle, which is the moſt ſenſible, the Glandulous Lachrymal Kernel adjoyning to it is contracted in both Eyes, but chiefly in that which is moſt afflicted, and ſo the Hole is uncovered. Alſo the Brain with its Membranes is contracted, by reaſon of that ſame ſad Senſation, and by means of that ſame Contraction preſſing forth the ſerous and pituitous Humors contain'd in its ſelf and its Ventricles, expels them through the Mamillary Proceſſes toward the Sive-like Bone and the Noſtrils; of which, the thicker Particles flow forth through the Noſtrils, the thinner and more fluid through the Lachrymal Holes.

Whence the great quantity of Tears.

XX. *Now to tell you why Tears continue ſo plentiful in Grief, ſo that many People weep for ſeveral days together*; that happens for this reaſon, for that the Brain being contracted with Sadneſs, is refrigerated, and cannot duly perform its Work of Concoction, ſo that a great quantity of ſerous Humors are ſeparated in this Glandulous Bowel from the Blood, which is carried thither for its Nouriſhment, and many crude Humors are alſo generated at the ſame time, which are continually preſs'd forth by that Contraction, and expell'd out of the Ventricles toward the Noſtrils. But when the Mind refrains from thinking of the ſad Accident, and the Contraction hereupon relaxes, that Effuſion of Tears ceaſes; but upon the return of ſad Thoughts, the Tears burſt forth again, by reaſon of the ſame preſſing and ſqueezing as before. But becauſe ſo large and moiſt a Bowel has humid Nouriſhment in great quantity, hence it is certain, that many and moiſt Excrements cannot but be generated therein, of which there is a long and moſt plentiful Increaſe, as in Catarrs and the Poſe; as we found in a Woman diſſected by Us in the Year 1663. who had long liv'd in a great deal of Grief and Sorrow, and had a thouſand times complain'd of a Heavineſs in her Head, and was very apt to weep and ſhed Tears in abundance, whoſe Brain was ſo moiſt, that a viſcous *Serum* diſtill'd out of the Subſtance of it, ſqueez'd by our Hand, as out of a Spunge dipp'd in Water, beſides that, the Ventricles were alſo ſufficiently fill'd with it. To this we may add, that the Vapors carried from the lower Parts of the Body to the Head, and ſo wont to be expell'd through the Pores of the Body, when it comes to paſs that the Pores are ſtreightned by that Refrigeration and Contraction of the Brain and its Membranes, cannot be expell'd, but being thickned, are ſqueezed toward the Noſtrils, together with the reſt of the Humors which greatly encreaſes the quantity of Tears.

By reaſon of the ſame bad Concoction of the Brain, it comes to paſs that many times the Tears are ſalt and ſharp, and corrode the Cheeks, and for the ſame reaſon it is that ſharp and ſalt Catarrhs happen, which by their Acrimony corrode the Teeth, and exulcerate the Chaps and other Parts, becauſe that by reaſon of their Crudity the ſalt Particles are more fix'd, and not ſufficiently diſſolved, nor exactly mix'd with the reſt of the ſerous Particles.

Which being ſo, four Doubts remain to be unfolded.

1. How it comes to paſs that People in ſorrow receive great eaſe from weeping, and that they find themſelves almoſt choak'd through ſorrow of Mind, and are oppreſſed with Heavineſs in their Heads, upon the ſhedding of Tears are very much reliev'd? The reaſon is, becauſe that in heavy Sorrow, the Brain is many times ſo contracted, that the Evacuatory Paſſages are ſtreightned, ſo that neither the pituitous and ſerous Humors can flow out, nor the Arterious Blood conveniently flow in, whence it appears that fewer Spirits are generated therein, and fewer Animal Spirits conſequently flow out from thence to the reſt of the Parts. Through the ſcarcity of which, the detention of the Excrements with all in the Brain, ſeveral inconveniences happen to Perſons in thoſe doleful Conditions; their Heads grow heavy, their Ratiocination and Judgment grow benum'd, moſt parts tremble, the Sight grows dim, the Reſpiration becomes ſlow, with deep Sighs and profound Sobs, difficulty of Swallowing, and the Orifices of the Heart are ſtreightned, ſo that they can neither expel nor receive the Blood; hence an extream Anxiety, which with all the other Inconveniences diminiſhes again, and the ſorrowful are extreamly eas'd, when the Evacuatory Veſſels being looſned, the ſerous and pituitous Humors flow through the Eyes, like Tears in great quantity, from the Brain, and alſo are evacuated through the Noſtrils, Palate and Mouth, which conſequently gives a freer acceſs of Arterious

Blood

Blood to the Brain, a more plentiful Generation of Animal Spirits, and a larger Influx into the Parts.

Why Men in great Sadneſs cannot weep?

XXI. 2. *How it comes to paſs that in extraordinary Sadneſs a Man cannot weep, yet perceives the foreſaid Anxiety with Heavineſs of the Head; but after he is ſomewhat come to himſelf, he pours forth Tears in great quantity with Relief.* Thus Hiſtorians tell us of *Pſammenitus*, who wept and beat his Head at the Death of his Friend, but when he ſaw his Children lead to Execution, beheld the Spectacle without ſhedding a Tear. Hence the ancient Proverb, *Light Sorrows talk and weep, vaſt Sorrows ſtupifie.* The cauſe of this is no other than the extream Contraction of the Brain; for in an extraordinary Conſternation, a Man is as it were aſtoniſhed, and the Brain as it were ſtupified, is every way more ſtrangely contracted, which cauſes the Humors to be coagulated and thickned to ſtop and ſettle therein. However, this extraordinary Contraction, when the griev'd Perſon recollects and comes to himſelf, and begins to bear his Grief with more Patience, is very much diminiſhed, ſo that the ſerous and pituitous Humors are more liberally expell'd out of the Brain, to the Relief of the Perſon, and Tears burſt forth more plentifully through the Evacuatory Paſſages, overſtreightned before, and now again open'd and looſen'd. And hence it is apparent, wherefore upon the giving of Wine freely to thoſe that are in Sorrow, the Tears that before ſtopp'd, in a ſhort time will burſt forth in great quantity: Becauſe Wine refreſhes the Heart and the Brain, encreaſes Courage, and mitigates Sadneſs, whence that extraordinary Contraction of the Brain is ſomewhat diminiſhed, and the Evacuatory Paſſages are again let looſe.

3. *Why thoſe that weep, weep in a ſhrill Tone, thoſe that laugh, make a deep Noiſe.* This is a Queſtion propounded by *Ariſtotle*, and the reaſon is, becauſe that at the time when Men are weeping and ſad, their Vocal Organs are ſtreightned and extended: but when People laugh, thoſe Organs are more extended and looſe, and moſt certain it is, that the Air cauſes a ſhriller Sound in narrow than in wide Pipes. Now the Vocal Organs are ſtreightned by the Cold; the Orifices of the Heart being contracted in great Grief, and conſequently little Blood and Heat is communicated from thence to the Parts, which cauſes the whole Body to ſhake with Cold.

Wherefore only Man weeps?

XXII. 4. *Why Man among all other Creatures, chiefly ſheds Tears?* Becauſe he of all Creatures being endued with reaſon, is only ſenſible, with great attention of Mind, of Sorrow, Mourning, Grief, *&c.* which is the reaſon that he alone ſuffers thoſe Contractions of the Brain, and Preſſings forth of the Humors. As for the Crocodiles, Harts, and if there be any other Beaſts that may be ſaid to weep, they ſhed very few Tears, and they chiefly ſeem to flow forth, partly by reaſon of the great quantity of ſerous Humors abounding in the Head, partly by reaſon of the uncovering of the Lachrymal Hole, the Contraction of the Caruncle of the bigger *Canthus*, cauſed by the cold Air, or ſome other Cauſe, which are two Cauſes ſometimes of Tears, alſo in Men, without any Agitation of the Mind or Fault in the Organ.

As to the end of Tears, Philoſophers generally alledge it to be on purpoſe to declare the Affections of the Mind, and to exonerate the Brain of its ſuperfluous Moiſture.

And thus we hope we have deſcribed the true Original of Tears, confirm'd not by Reaſon only, but Experience.

CHAP. XVI.

Of the Veſſels and Muſcles of the Eye.

The Arteries.

THE *Eyes which are the Organs of Sight, conſiſt of three Parts; of which, ſome ſerve for Nouriſhment, as the Arteries and Veins; others to cauſe and facilitate Motion, as Muſcles, Fat, Kernels and Lymphatic Veſſels; others contribute to the Sight it ſelf, as Optic Nerves, Tunicles and Humors.*

I. *The Arteries which carry the Vital Blood to the Nouriſhment of the Eyes, Muſcles, Kernels and Fat, are properly external, from the External Branch of the* Carotis; *partly internal, from the inner Branch of the ſame* Carotis, *which*

constitutes the Nett-Reſembling Fold.

Veins. II. *In like manner there are alſo External Veins, ſo viſible in the White of the Eye, which run forth to the External Branch of the Jugular, as internal accompanying the Optic Nerve, running along to the Inner Branch of the ſame Jugular Artery.*

Of the Kernels and Lymphatic Veſſels has already been ſpoken, *Chap.* 14.

Muſcles. III. *The Eyes of Men are mov'd every way by the Aſſiſtance of ſix Muſcles, ſurrounding the Eyes below the Cavity of the Orbit.* Of theſe, the four greater being ſtreight, cauſe a ſtreight Motion, upward, downward and ſideway. The two much the leſſer, cauſe an oblique Motion. Between all which, there is interlay'd a ſufficient quantity of Fat to facilitate the Motion; as alſo to moiſten, warm and ſmooth the Eye.

Their Original. IV. *All theſe ariſe with an accute beginning from the deepeſt part of the Orbit, near the Hole through which the Optic Nerve enters the Orbit, to the Membrane of which they adhere, and end in a moſt ſlender Tendon, ſticking to the Horny Tunicle*; in which all the Tendons being joyned together in a Circle, make a kind of a Tendonny Tunicle, vulgarly call'd the *Innominate*, which is joyn'd to the Eye like a broader Circle, only it does not encompaſs it.

The Innominate Tunicle.

The upper Muſcle. V. *The firſt of the Right Muſcles, which is the uppermoſt and thickeſt, raiſes the Eye*; which being a Motion uſual among haughty People, is thence called the Proud Muſcle.

The Humble Muſcle. VI. *The ſecond, which is leſſer and oppoſite to the firſt, from its lower or more humble Seat where it is placed, is called the Humble.*

The Bibitory Muſcle. VII. *The third, which ſtands in the inner Corner, brings the Eye inward toward the Noſe*; which becauſe it is familiar with thoſe that drink, while they look in the Glaſs, is called the *Bibitory Muſcle.*

The Indignabund. VIII. *The fourth, which moves the Eye toward the outer Parts to the little Corner, is call'd the Indignabund*, becauſe it expreſſes the lateral Aſpect of diſdainful and ſcornful People.

The firſt Oblique Muſcle. IX. *The firſt of the Oblique Muſcles, which is ſlender, round and ſhort, ſeated in a lower Place, and in the Extream Part of the lower Orbit, that is to ſay, at the joyning of the firſt Bone of the Jaw, with the fourth Bone, aſcends toward the outer Corner of the Eye-lid, and there embracing the Eye tranſverſly, with a ſhort Tendon toward the upper Parts meets the Tendon of the other Eye, and moving the Eye downward, turns it and brings it to the outer Corner.*

The ſecond Oblique Muſcle. X. *The other of the Oblique Muſcles, which is thinner, longer, and ſeated above, riſing from the common Beginning, together with the third of the ſtreight Muſcles, is carried directly to the inner Corner of the Eye, where paſſing the Griſly Winding with a ſlender Body (hence called the* Trochlear *Muſcle) proceeds with an Oblique turning through the upper Parts of the Eye, and terminates near the End of the Oblique Tendon of the lower Muſcle.*

The Trochlear. XI. *Now the* Trochlear *Griſtle is a perforated Griſtle, hanging forward to the Bone of the upper Jaw, near the inner Corner of the Eye*; the firſt finding out of which *Spigelius* attributes to *Fallopius*, but *Riolanus* aſcribs to *Rondeletius.*

Theſe two Oblique Muſcles, becauſe of the ſecret Allurements of Lovers Glances, are called *Amatorious*; but from their rowling Motion, *Circumactors.*

A ſeventh Muſcle in Brutes. XII. *In Brutes, that feed with their Heads toward the Earth, beſides theſe ſix Muſcles, there is alſo a ſeventh*, which is ſometimes obſerved to be divided into two, but rarely into three Muſcles. This being ſhort and fleſhy, encompaſſes the Eye, and is inſerted into the hinder part of the Horny Tunicle, and ſuſtains the looking down continually upon the Ground, and draws it back when its own weight carries it farther out.

The Nerves XIII. *The Muſcles are endued with a moving Power by the little Branches of the ſecond Pair of Nerves, which are chiefly inſerted into the ſtreight Muſcles.* For the innermoſt Oblique Muſcle receives a little Branch from the fifth Pair; the outermoſt Oblique receives a little Branch from the

ſlender

ſlender Pair that ſtands next before the Fifth.

Why the Eyes move

XIV. *Here ariſes a Queſtion, when each Eye has diſtinct and proper Muſcles, why they do not move with various Motions, but are always mov'd together with the ſame Motion?* *Ariſtotle* aſcribes the Cauſe to the Coition of the Optic Nerves, and *Galen* and *Avicen* ſeem to be of the ſame Opinion. But in regard the Optic Nerves are only viſory, and contribute nothing to Motion, nor enter the Muſcles, they cannot be the cauſe of this thing. Beſides, Anatomiſts have now found it out, that this Conjunction of the Optics is wanting in ſeveral men, and yet the motion of their Eyes, while they liv'd, was the ſame as in other men, ſo equal always, that the Sight of both was always directed to one Point. *Andrew Laurentius* ſays, that ſuch an equal Motion is requiſite for the perfection of the Senſe; and ſo he only propoſes the end of the Motion, but does not explain the Cauſe. Others alledg that this equal Motion proceeds from hence, that the moving Nerves are mov'd together at their beginning. But it appears from this Conjunction, that the Spirits indeed may flow to the Muſcles of each Eye, however it is not manifeſt, why the Spirits flow more eſpecially in greater quantity into theſe or thoſe Muſcles of the Eyes, and not into the ſame, external and internal of both Eyes. For Example's ſake, ſuppoſe a Man would look for ſomething upon his Right-Side, preſently the Spirits are determined toward the external Muſcle of the Right-Eye, and the internal Muſcle of the Left-eye, and ſo the Sight is turned to one Point through the two various Muſcles of each Eye. But if the Union of the Beginning of the Nerves of the ſecond Pair ſhould any way contribute to this, in regard of that Union, it would be requiſite that the Spirits ſhould flow at the ſame time into the ſame Muſcles of both Eyes, as well external as Internal, and ſo by vertue of that Motion, both Eyes would look ſeveral ways upon ſeveral things, and not upon the ſame.

And therefore the true Reaſon proceeds from the Mind; for when the Mind intends to behold any thing; one Eye is not to be turn'd to this, another to that thing, for ſo there would happen a Confuſion of the Rays and Perception in common Sence; but both Eyes are of neceſſity to be turn'd toward the ſame thing; and hence the Spirits are always determin'd to thoſe Muſcles that can draw both the Eyes toward the ſame Object, but not to ſuch Muſcles as draw each Eye ſeveral ways. Becauſe the Mind always intends to behold one Object apart; and though it may often intend to behold ſeveral things, yet it obſerves a certain Order, and beholds one thing after another, which may be done with a ſpeedy Motion, if the Objects are ſo near and large that they may be eaſily perceiv'd. But if the Object be remote and ſmall, then both Eyes muſt of neceſſity be longer fix'd upon the Object, and a greater quantity of Rays are requiſite to flow into the Eyes, for the better Perception of what the Mind is intent to behold.

CHAP. XVII.

Of the Bulb of the Eye.

THE *Bulb of the Eye conſiſts of Membranes and Humors.*

The Membranes are either common or proper.

The Common Membranes are two-fold, Adnate *and* Innominate.

The Adnate Tunicle.

I. *The firſt next the Bone, or* White Adnate, *by the* Greeks *call'd* ἐπιπεφυκὸς, *becauſe it adheres to other Membranes of the Eyes, by* Galen *and* Hippocrates *call'd, the White of the Eye, is a thin Expanſion of the Pericranium above the Sclerotic, as far as the Circle of the Iris, joyning the Eye to the Orbit and inner Bones, whence it is called the Conjunctive.* It is endued with an exquiſite Sence of Feeling, being ſprinkled with many diminutive Arteries and Veins. Through which little Arteries, when there is a greater Afflux of hotter Blood, then a Reflux through the diminutive Veins, then happens an Ophthalmy, of which Diſtemper, this Membrane is the Seat.

The reaſon of an Ophthalmy.

The Innominate Tunicle.

II. *The other, by* Columbus *call'd the* Innominate, *is nothing elſe than a thin Expanſion of the Tendons of the Muſcles concurring to the Corneous Tunicle, produc'd to the very Circumference of the Iris, to which it adheres, like a ſmall broad Ring,*

which causes the White of the Adnate Tunicle to look more bright. *Bauhinus*, *Riolanus*, and *Casserius* will not allow this Tunicle to be number'd among the Tunicles, but rather among the Muscles of whose Tendons it consists. However *Galen* makes mention of it among the Tunicles of the Eye, but gives it no Name, and therefore perhaps by *Columbus* call'd the Nameless or Innominate.

A Membrane proper to Cows and Oxen.

III. *Besides these two common Membranes, in an Oxe there is another Membrane, which is the outermost of all, not sticking close to the Eye, but endued with Motion and a Muscle.* By means of which, Cows and Oxen close and twinkle with their Eyes, yet their Eye-lids remain open all the while.

Proper Membranes.

IV. *The Proper Membranes or Tunicles are three, of which, the first and outermost is said to proceed from the* Dura Mater, *and expands it self about the Bulb of the Eye.* It is call'd the *Sclerotic* from its hardness; though *Fallopius* will not allow the former, believing it to differ very much from the *Dura Mater*, both in substance and thickness. The *Sclerotic* enfolds the whole Eye, and is thick, hard, tough, equal, opacous behind, before transparent like a bright Horn, and polish'd, whence it had the Name of the *Horny Tunicle.* Which Name however many times is given to the whole *Sclerotic*, by reason of its horny thickness and hardness: Though it be thick and hard, yet it is generally thought to be single; though *Bauhinus* will have it to consist of several Rinds, or four, as it were thin Plates, and affirms that from hence it was that *Avicen* alledg'd it to be four fold. But this same Quadruplicity is more easily to be conceiv'd and imagin'd from the thickness and hardness of it then to be demonstrated.

Sclerotic.

The Choroides.

V. *The second and middle Tunicle, which is much thinner than the former, arising from a thin Film, and sprinkled with several diminitive Vessels, because it enfolds the Humors, of the Eye, as the* Chorion *does the Birth, is call'd Choroides*; only the forepart of it, where it is thicker and doubled, and perforated in the middle for the Transmission of the Rays, is call'd *Rageides*, or Uveous, from the Colour of a Grape, which Name is also given to the whole Tunicle.

The Colours of it.

VI. This on the inside is endued with several Colours; nevertheless in Man it is usually more obscure, in Cows and other Creatures that see in the Night, of a bright Green, or else Brown or Yellow. Hence *Aquapendens* believes that those Creatures only see in the Night, whose innermost Colour of the Uveous Tunicle is very bright, which if it happen in a Man, he shall also see in the Night; as it was natural for *Tiberius Cæsar* to do.

The outermost part which touches the Horny Tunicle, is overshadowed with a kind of dark Colour, which dyes the Fingers of those that touch it of a black Hew. It is endued with this black Colour, chiefly necessary for the Perfection of Sight, in the first delineation of the Parts, and hence it comes to pass, that in a new shap'd *Embrio*, it shews it self through the Filmy Coverings of the Eye-lids, and the Sclerotic Tunicle it self. In this same blackish Colour of this Tunicle, the Rays and Species of things visible are stopt, as in a Looking-Glass, which to that end is overlaid behind with Quicksilver, that they may not pass any farther, but that being reverberated, they may be the better offered to the common Sensory, and represented to the Mind.

The Iris.

VII. *Some Portion of this transparent through the Corneous Tunicle, carries a mixture of Colours, and hence, as representing the Rainbow, is call'd Iris,* in some blacker, in some blewer, in others greener, in others browner, which Colours are not only to be observ'd in individual Persons, but in whole Nations, as the black Colour is most usual among the *Ethiopians* and *Chineses*, the Green among the *Tartars*, the Blewish among the *Belgians* and Northern People, the Dusky among the *Italians* and neighbouring Nations.

The Ciliar Ligament.

The Circumference of this Portion is firmly fastned to the hard Tunicle, *Riolanus* writes, that it may be separated circularly with the Edg of a Penknif, and that this same Crown of the Uveous Tunicle is to be found altogether separated in the Eye of a Cow, when parboyl'd, and therefore he believes it to be a Membrane distinct from the Uveous Tunicle; having peculiar Fibers, and a proper Motion in the Dilation and Contraction of the Sight of the Eye. However at this day the said Portion is by Anatomists, generally taken

ken for the Continuous Part of the Uveous Tunicle it self.

The Apple of the Eye. VIII. *Now the Uveous Tunicle is perforated in the middle Part before, in men with a round hole, in Brutes with an Oblong or Oval hole which the Latins call* Pupilla, *the Greeks* κόρην, Ruffus γλαύκην *and* Hippocrates ὄψιν, *by means of which the Rays of Visible things, being receiv'd by the Chrystalline Humors lying upon that hole, enter the Eye.*

This hole is sometimes dilated, sometimes contracted, as the Animal Spirits flow into the Eye in a greater or lesser quantity. Here *Aquapendens* and *Sennertus* are under a great mistake, who believe this dilatation and contraction to proceed from a stronger or weaker Light. Certainly Light it self introduces nothing into the Eye for the Expansion or Contraction of it, but it is the cause that more or fewer Spirits flow into the Eye: so that by their influx the Apple of the Eye, becomes sometimes wider and sometimes narrower, according to which diversity we see better or worse: for a moderate contraction causes a quicker sight, a dilatation too wide causes a weaker sight: for that in the one the Spirits are more collected together, and the visible Rays are more easily gathered to a point; in this not so well.

The Ciliar Ligament. IX. *From the Circumference of the Nervous Tunicle, in the forepart where it rests upon the Chrystaline humor, arises a Ligament, call'd the Ciliar Ligament, which consists of thin strings or fibres, like diminutive black Lines (which are like the hairs of the Eye-brows) running forth from this Circumference toward the prominent Crystaline humor, girding it about and fastning it to the Uveous Tunicle.* *Vesslingius* and *Cartesius* not without some probability affirm that by the Assistance of this Ligament, the Contraction and Dilatation of the hole in the Uveous Tunicle is perform'd, frequently as the Man pleases himself; and moreover that it causes a gentle Motion of the Crystalline humor it self, toward the fore and hinder Parts, as the necessity of sight variously requires. Though others ascribe this Dilatation and Contraction to the small slender Fibers or Strings dispierc'd through the Net resembling Tunicle, as into which they say that the Animal spirits flow in greater or lesser quantity, according to the various qualities of the Objects, and by that means more or less dilate the sight of the Eye.

The Retina. X. *The Third Membrane or Tunicle because it resembles a Casting-Net, is therefore call'd* Retina, or Retiform'd, *by the* Greeks ἀμφιβληστροειδὴς, *from Embracing or Enfolding.*

The Substance of it is soft and slimy, wherein as well certain slender, small Strings, or diminutive little Vessels, deriving themselves from the *Choroid* Fold and the wonderful Net, are manifestly to be discover'd conveighing Blood for the nourishment of it. Which nevertheless *Platerus* does not seem to have observ'd, nor *Riolanus* to have seen.

This Tunicle call'd the Net-form'd is commonly deliver'd to be the Expansion of the inner narrower substance of the Optic Nerve, or Brain, about the Vitreous humor, as far as the clear Ligament. But in regard the substance of this Tunicle has little or no resemblance to the pithy substance of the Brain, seeing it receives small Blood-bearing Vessels, which are manifestly conspicuous to the sight, which are not to be found in the substance of the Brain, it does not seem to be any Expansion of the Medullary substance of the Brain, but rather a certain peculiar part, constituting the primary part of the Organ of sight, wherein the Colors of visible Rays are depainted, and thence by means of the Optic Nerve and Spirits communicated to the Mind, and so perceiv'd: as we find such another peculiar substance under the Membrane of the Nostrils and Tongue, which constitutes the primary part of the Organs of Smelling and Taste.

XI. *Besides these three proper Tunicles necessary to the whole Eye there are two other which particularly enfold the Chrystalline and Vitreous humor.*

The Humors of the Eye. XI. *The Humors belonging to the Eye are threefold, the Watry, Glassy and Chrystaline,* distinct from one another, all transparent and all void of Colour. Partly to prevent the visible Rays from stopping in them; partly that the Rays of visible things colour'd, being alter'd by no colour of the Eye, may be able to pass to the Net-form'd Tunicle, to be thence offer'd to the common Sensory such as they are. For in regard the judgment of colours must be made in the Brain by

by the Eye, of neceſſity thoſe parts of it that receive and tranſmit the Rays of things colour'd, muſt be void of all colour.

The Watry Humor.

XII. *The Watry Humor, thin, pellucid, void of all colour, moderately copious and fluid, waſhes the foremoſt ſpace between the Corneous Tunicle, and the ſeat of the Chryſtaline Humor having no proper Tunicle belonging to it, but is comprehended between the Horny and Grape-like Tunicle before the Apple of the Eye.* By ſome this Humor is call'd, ὠοειδὴς, or *Albugoneius*, though irroneouſly, there being no reſembance between the White of an Egg and this Humor, nor any ſuch Viſcoſity; but a thin and fluid Liquor.

The ſeat of it.

XIII. *Here ariſes a doubt, whether it poſſeſs the forepart of the Eye, and be only placed againſt the Chryſtaline humor, or whether it be ſpread about the Vitreous humor.*

Riolanus believes it not only to be contained in the forepart, but to be ſpread about the Vitreous humor, becauſe that if the Corney and Uveous Tunicle be open'd in the hinder part, there will flow forth a watry humor through the wound. *Plempius* reproves *Riolanus*, and ſays he has found the contrary by experience, as having perforated the hinder part of the ball of the Eye with a Needle, and yet no watry Humor iſſu'd forth. And thence concludes that it was the vitreous Humors which *Riolanus* ſaw diſtilling forth by reaſon of ſome prick in the vitrious Tunicle. But it may be reply'd to *Plempius* that that Experience little makes for the proof of his Opinion, for that upon the drawing forth of the Needle moſt certain it is, that the little hole made in the corneous Tunicle will ſuck it ſelf to a cloſure ſo ſuddainly that no Liquor can iſſue forth; as we find in the couching of Cataracts; for that the Needle being drawn out again, no water diſtills from that ſmall wound, by reaſon the wound preſently ſucks it ſelf cloſe again. But if we examin this difference more exactly we ſhall find, that the watry Humor contained about the Apple of the Eye is different from that which flows from the hinder part of the ſight, and that this is not only the thinner but alſo is contain'd and fix'd before the ſight, not running any farther, toward the hinder parts of the Eye; but that the hindermoſt Liquor is clammy and thicker than the other, and that it is nothing elſe but a certain watry Juice, ſeparated from the Vitreous Humor, the proper Vitreous Tunicle being hurt, and grown thin for want of Spirits, or admiſſion of the colder Air; for if you hold the Vitreous Humor in your Hand in the Air never ſo ſhort a while, a kind of a clammy Liquor will diſtil from it in ſlow drops.

Whether a Part of the Body?

XIV. Some queſtion whether this Humor be a part of the Body? as *Laurentius* and *Mercatus*, and they that accompt Blood to be a part of the Body. Theſe *Caſſerius* and *Plempius* oppoſe, and that not without reaſon, for that not being circumſcribed within its own Limits, nor united in continuity to the Body, but many times in Wounds of the Eyes being wholly loſt, is reſtored again, therefore it ſeems not proper to be reckoned among the animated Parts. Now that it is reſtored when loſt, appears out of *Galen*, who relates the Example of a Boy, who was ſo prickt in the Sight of the Eye with a Pen-knife, that all the Watry Humor was let out of his Eye. Nevertheleſs, in a ſhort time after, ſo ſoon as the Watry Humor was again recruited and collected together, the Boy recovered his Sight: and *Hildan* alſo relates two more Examples of the ſame Nature.

Whether an Excrement?

XV. This difficulty others obſerving, rather chooſe to aſſert, that it was an Excrement of the Cryſtallan Humor; for which reaſon it came to paſs, that being evacuated and loſt, it was frequently reſtored again. But this Argument convinces them, that all Excrements of the Body daily increaſe anew, and therefore of neceſſity they muſt have ways and means, by which they be again evacuated, whereas there are no ways for the Evacuation of this Humor. If therefore this Humor being evacuated, could be regenerated in a very ſhort ſpace, there ought to be manifeſt Paſſages allowed, through which the redundancy of it may be again evacuated; for they ſay, that being evacuated by the pricking of the Eye in a Chicken, it will renew again within the ſpace of fifteen days. But no Man ever found out thoſe Paſſages in the Horny Tunicle, nor ever can find them out if there be none, therefore this Humor, by its continual increaſe, muſt diſtend the Eye to an immenſe proportion, at leaſt in aged Perſons, it muſt of neceſſity be very copious, by reaſon of the Collection of many years; but in Infants

fants very little would be found, whereas Experience tells us quite the contrary in both. Therefore we muſt conclude that this Humor is no part of the Body; not ſo much as an Excrement, but a certain Liquor ordain'd for the Perfection of the Sight, no leſs than the Blood for Nouriſhment, and generated out of the moſt lympid Particles of the Blood, and that as the Blood is no part of the Body, not ſo much as an Excrement, but a Humor neceſſary for Nouriſhment, and the ſupport of Life, ſo the watry Humor of the Eye is neither an enliven'd Part of the Body, nor any Excrement, but a Liquor to maintain the Eye, and perhaps ordain'd for the Nouriſhment of the Cryſtalline and Vitreous Humor.

The uſe of the watry Humor.

XVI. The uſe of this Humor is to water and make ſlippery, and perhaps to nouriſh the other two thicker Humors, together with the Uvious and Net-like Tunicle, and to diſtend the horny Tunicle to prevent its growing wrinkel'd and opacous, to darken the too much Splendor of the Light, and dilate the viſible Rays. But if it recede from its Purity, and become thicker, then the Sight of the Eye becomes dull. If there be any thicker Particles that ſwim within it, then Gnats, Flys, Straws, Spiders Webbs and the like, ſeem to peſter the Sight, and to hang always before the Eyes. If thoſe thicker Particles ſo meet and ſtick together, as to generate a Film, that covers the Hole of the Apple of the Eye, then the Sight is loſt, by reaſon that the Entrance of the viſible Rays into the Chryſtalline Humor is prevented, The beginning of which Defect, is by the *Greeks* call'd ὑπόχυμα, by the *Latins Suffuſio*, and when it is come to a Head *Cataracta*.

The Vitreous Humor.

XVII. *The Vitreous Humor, like melted Glaſs, much more fluid than the watry Humor, and much ſofter than the Chryſtalline, and in quantity exceeding the Watry three times, the Chryſtalline four or five times, poſſeſſes the whole hinder Part of the Eye.*

In the hinder part, where it joyns to the Net-form'd Tunicle, it is round, in the former part, though plain and flat, yet ſomewhat hollow in the middle where it receives the Chryſtalline Humor. It is ſurrounded with a moſt thin pellucid *Tunicle*, call'd the *Vitreous*, by which it is ſeparated from the other two Humors.

The Vitreous Tunicle.

XVIII. The uſe of it is to dilate the Rays of viſible things receiv'd from the Chryſtalline, and being ſo dilated to repreſent them to the Net-form'd Tunicle. Others, who believe the Sight to be in the Optic Nerve, affirm the uſe of it to be to this purpoſe, that the Rays being refracted in it, after they have paſs'd the Chryſtalline Humor, may come together in one Point, to the end the Image may be repreſented to the Sight. *Its uſe.*

The Cryſtalline Humor.

XIX. *The Cryſtalline Humor, by the* Greeks *call'd* κρυσταλλοειδὴς *from its clear Tranſparency, as alſo* Glacialis, *reſembling the cleareſt Icicle that may be, is more ſolid and bright than the other two Humors, generated out of the moſt tranſparent and pureſt part of the Seed.*

Before it poſſeſſes the Hole of the Uveous Tunicle, behind it is received into a Hollowneſs fram'd in the Vitreous Humor, and ſticks cloſe to it. In the forepart it is a little more flat, behind a little more round, though this Figure ſeems often to vary according to the various Affections of the Eye.

The Cobweb Tunicle.

XX. *This Humor is ſurrounded or encloſed with its own proper Tunicle, extreamly thin and tranſparent, therefore call'd* Chryſtalloidæa, *and from the form of its Contexture, the Cobweb Tunicle.* By means of this Tunicle it is ſeparated from the other Humors; to which alſo, in the hollowneſs of the vicious Humor, the vicious Tunicle ſticks very cloſe, but yet is diſtinct from it. *Riolanus* will not allow of this Tunicle, not ſo much as in the forepart, as being that which he believes to be very finely poliſh'd, by reaſon of the thickneſs of the Cryſtalline. But the Sight it ſelf evinces this Error: For it is plain, that that ſame Tunicle, though very ſlender, may be in ſome meaſure ſeparated, and that that being endamag'd, the exterior part of the Humor it ſelf does but very little trickle forth. Thus ſays *Julius Caſſerius*, in theſe Words, *Nay, I have ſhown this Tunicle viſibly ſeparated from the Cryſtalline Humor it ſelf.*

The uſe of the Cryſtalline Humor.

XXI. *The Rays of viſible things being dilated in the Watry Humor, are firſt received by this Cryſtalline Humor, and hence paſs through the Vitreous Humor to the Net-form'd Tunicle, and ſo are preſented to the Common Senſory.* Therefore in conſiderati-

deration of the first Reception or Collection, the Crystalline Humor is the first Instrument of Sight; but in consideration of Perception, the Net-form'd Tunicle, as being that by means whereof the Rays receiv'd, are offer'd to the common Sensory where they are perceived. In the mean time all the Conjunction of all the Parts of the Eye is so close and so necessary, to the end that one may not act without the other, while the Defect of the meanest part, even of the aqueous Humor, puts a stop to the primary Operation of the whole Organ.

Whether Parts of the Body?

XXII. *Here arises another Doubt, whether the Crystalline or Watry Humor are Parts of the Body?* As for the Crystalline, we must conclude, that it is really a Part of the Body, because it is enfolded in its proper Cob-web-Tunicle, perfects the Act of Seeing, together with the other Parts, lives, is nourish'd, is generated in the Womb, has its proper Circumscription, is a Body adhering to the whole, and filling it together with other Parts, conjoyned by common Life, and ordain'd to its Function and Use. And if its Substance be more narrowly considered, it is not truly a Humor, though vulgarly so call'd, but a Body sufficiently firm and solid; which being boyl'd in Fish, may be divided into little Fibers, and is much more firm than Fat, the Brain, or the Marrow. Hence *Galen* deservedly reckons it among the Parts of the Body, and those the similar Parts too, because it is divided into Parts like to its self; as also the Organic Parts, because it is ordain'd to perfect the Act of Seeing, and to that end has a certain determin'd and sensible Formation.

The same Question concerning the Vitreous Humor is resolv'd by the same Reasons. And though some affirm the Crystalline Humor to be nourish'd by this Vitreous Humor, that however is improperly said; perhaps, because there are some who think it prepares Nourishment for the other; though indeed it no more nourishes the Crystalline Humor, than the Heart nourishes the Arm: besides, that there is no need of so bright and large a part for the Nourishment of the Crystalline Humor; neither is it less proper for it to be nourished by the Blood, then the Nerves, Marrow, Brain, or any other whitish parts of the Body.

Whether these Humors are sensible?

XXIII. *Julius Casserius* of *Placentia*, was the first that brought another Question upon the Stage concerning *these Humors, Whether they are endued with the Sence of feeling*? As for himself, he allows them a most exact Sence of feeling. For my part, I allow this Sence to their Membranes, but not to the substance of the Humors it self, in regard that the Membrane alone is the Organ of Feeling. In like manner as the Teeth and Bones, whose proper Substance, though it be destitute of the Sence of Feeling, yet the Periostium's are sensible, and so they are allowed the Sence of Feeling.

Now the Animal Spirits contribute the Power of Seeing to the Eye, being framed of all these Parts; which Spirits flow into it in great quantity through the Optic Nerve. But they flow into it sometime in greater, sometimes in lesser quantity; and hence it is that the Eyes swell sometimes more, sometimes less, sometimes are more quick-sighted, and sometimes less. Thus they are more Tumid in young Persons, Plethoric, People that are angry, and given to drink. They are less turgid in aged Folks, such as are given to Venereal Exercises, those that are Sad, or emaciated for want of Food. They are also said to be more turgid in Virgins then those that have known Man. But though a moderate Swelling of the Eye caused by the Spirits, renders the Sight more quick, yet it does not follow, that upon every Swelling of the Eye, the Sight should be more quick; for we find the contrary in People intoxicated with Drink, whose Sight is but dull, by reason of the turbulent and disorderly Influx of the Spirits.

The Action of the Eye.

XXIV. The Action of the Eye is manifest and known to all Men to be Seeing.

Definition of Sight.

XXV. Now this Seeing is a Sence, whereby from the various Motion of the visible Rays, collected in the Crystalline and Glassie Humors, and striking upon the Net-form'd-Tunicle, Colours are perceiv'd with their light Situation, Distance, Magnitude, Figure and Number.

As to the Manner, Medium and Object of Sight, and many other things thereto belonging, those Philosophers are to be consulted, who have made it their business to write altogether upon that Subject, and therefore to avoid unnecessary Prolixity, are here omitted; since they cannot with a sufficient Accurateness be briefly run over, but require a whole Treaties of themselves, such a one, as among

mong others. *Descartes* has written, *Lib. dioptric. & Lib. de Hom. artic.* 18, 19, 20. as also *Julius Casserius, de Org. Visus*; and *Plempius* in his *Ophthalmographia.*

CHAP. XVIII.

Of the Organs of Hearing, and Hearing it self.

I. AS the Eyes, the Beholder of the wonderful Works of the Supream Deity, and the Discoverers of what is to be desired or avoided, are placed in the upper part of the Body, so *for the understanding of Wisdom and all sorts of Knowledg, the Organs of Hearing are placed on each side not far from them, in Latin Aures, by the Greek* ὦτα *and* κατα, *to give us notice of imminent Good or Evil*, which cannot be discern'd by the Eye, either in the Dark, or through the Interposition of thicker Bodies, or the distance of the Place; seated in a high part of the Body, the more easily to receive the Twirlings and Circulations of the Air, in Motion diffus'd through the upper Parts of the wide Concavity.

The Organ of Hearing.

Their Number.

II. *The Supream Architect created two, perhaps, that if any Defect should befall the one, the other might supply its Office; or else be placed one on each side of the Temples, for the better distinguishing of Sounds on the Right or Left Side of the Body.* The outward Part expanded like a winnow, which is not primary, but an assisting Organ of Hearing; first, collecting and receiving Sounds, is by the Greeks properly call'd ὦς, by the Latins *Auris*, the upper parts of which are call'd Wings, by the Greeks πτερύγωμα, but the lower and soft Lobe of the lower Auricle, retains the ancient Name of *Lobus* still.

Their Magnitude and Figure.

III. *The Ears of Men are but small, semicircular and neatly fram'd and fashion'd with various Protuberances and Concavities, in which the sound being receiv'd together with the Air, it does not presently slip out again, but stops a little, and is somewhat broken, to the end that thence it may the more directly, and with less Violence, enter the innermost Caverns of the Ear.* Insomuch, that they who are depriv'd of this part by any unfortunate Wound, hear much less distinctly, and with more confusion, receiving the Sounds of Words like the Murmuring of a Stream. Hence it is that they who are Deafish clap the Hollow of their Hands to receive a louder Sound of the Air in Motion, for the greater benefit of their Hearing.

IV. Of these Protuberances, the outermost, by reason of its winding and turning Figure is called *Helix*, and the other opposite to it *Anthelex*; that which looks toward the Temples, because it is hairy in some People like a Goats Beard, is call'd *Tragus*, or *Hircus*, and the Part opposite to it, to which the lower Auricle is appendent, is call'd *Antitragus*, which is also hairy in some People.

Helix. *Anthelix.* *Tragus.* *Antitragus.*

V. The innermost of the Cavities, which is as it were the Porch of the Auditory Passage it self, by reason of the yellow Excrement therein contracted, is by some call'd *Alvearium*; the outermost, which is the bigger from its winding and turning *Concha*, by the Greeks κόγχη; the third, which is comprehended between the Helix, and Anthelix, has hitherto no peculiar Name allow'd it.

Alvearium. *Concha.*

VI. From the Shape and Bigness of the outward Ear, the Ancients have drawn several Observations. *Aristotle* and *Galen* makes Ears of a moderate bigness, and erected to be a Sign of the best sort of Men. *Polemon, Loxus, Adamantius*, and *Albert* asserts, that Quadrangular and Simicircular Ears of a moderate Magnitude declare a Man Stout, Honest and of great Parts. Large Ears denote Sotishness, Imprudence, and Talkativeness, but a great Memory, and moreover they presage a long Life, as *Rases* and *Pliny* relate out of *Aristotle*. Very small Ears testifie a Fool, a Person of ill Condition, thievish and Libidinous, as *Aristotle, Galen*, and *Polemon* relate. Short and extended Ears, as in Dogs, as also short and compressed, both are Signs of Folly, according to *Polemon, Adamantius*, and *Albert* out of *Loxus*. Long and narrow Ears shew a Man envious and wicked, according to *Polemon, Albert*, and *Conciliator*. Ears over-round, and not well hollowed, betoken a Man Indocible; but when hollowed exactly, a Person docible, as the same Authors testifie. When the inferior Lobe of the Ear is joyn'd to the Flesh of the

Indications.

Jaw-bone, it ſignifies a vain Fool, by the Teſtimony of *Avicen.*

The Parts of the Ear. VII. *The Ear conſiſts of various Parts, of which ſome are common, others proper.*

The common Parts are the Cuticle, a very thin Skin, and a nervous Membrane under it, and a little Fat in the Inferior Lobe.

The proper Parts are a Griſtle, Muſcles and Veſſels.

The Griſtle. VIII. *The Griſtle conſtituting the upper and larger Part of the Ear,* to keep the Ear expanded and open, ſticks faſt to the Stony-bone, by means of a ſtrong Ligament ariſing from the Pericranium.

For this reaſon, in Men it is almoſt immovable, and there are few Men can move their Ears at Pleaſure; though *Schenkius* brings ſome few Examples out of others, which Motion is perform'd by the benefit of four Muſcles, only *Caſſerius* talks of ſix, which are very ſlender, and being hardly conſpicuous, reſt upon this Griſtle, which *Galen*, by reaſon of their extraordinary ſlenderneſs calls the Lineaments of the Muſcles.

The Muſcles. IX. *The firſt of theſe Muſcles common to the Ear and both Lips,* drawing the Ear downward to the ſide, is implanted in the Root of it under the Lobe, and is part of the ſlender four-ſquare Muſcle moving the Cheeks and Skin of the Face.

The ſecond lying upon the Temple Muſcle, and moving the Ear upward and forward, deſcends near the beginning of the Muſcle of the Front, and being made narrower by degrees, is inſerted into the upper part of the Ear.

The third raiſing the Ear, though very little toward the hinder Parts, riſes above the Mamillary Proceſs, with a narrow beginning from the hinder part of the Head, and then becoming broader, ſometimes with two, ſometimes with three Tendons, enters the Root of the hinder Griſtle.

The *Fourth,* being of the ſame uſe with the former, and proceeding with a broad Original from the Mamillary Proceſs, vaniſhes into a Tendon, of which there are ſome that make three Inſertions into the Root of the Griſtle.

In Cows, Horſes, and ſeveral other Brutes, theſe Muſcles are large, and frequently more, which is the reaſon thoſe Creatures move their Ears very ſtrongly, and are able, by that means, to ſhake of Flies and whatever elſe proves troubleſome to thoſe Parts.

The Veſſels. X. The Veſſels belonging to the Ear are threefold.

1. *Little Arteries from the Carotides, of which, one that is bigger than the reſt creeping through the Tragus and Anthelix, and aſcending the upper part of the Jaw, affords vital Blood to each of the Teeth,* with which ſharp Humors ſometimes flowing down, are the cauſe of moſt cruel Pains in the Teeth, which we have ſeen wonderfully cur'd by an actual Cautery to this ſhooting forth of the Arteries in the Anthelix; which is obſerv'd by *Bauhinus.* And *Riolanus* reports, that he ſaw a Perſon at *Paris,* who got a great deal of Money by this way of Cure, as we obſerved another, who practiſed the ſame Cure in *Gelderland.*

2. Very ſmall diminutive Veins that run from the Ear to the Jugulars.

3. Two little Nerves, that creep from the ſecond Pair of the Pith of the Neck along the ſides, and hinder Region of the Ear; to which is joyned a ſmall Branch from the harder Portion of the fifth Pair, proceeding through the Blind-hole.

The Paroti-tid Glands. XI. *Without ſide there ſtands adjoyning to the Ears, various little Kernels, thick and remarkable, call'd* Parotides, *not only behind the Ears, but alſo under the Ears, and upon each ſide.* Between theſe, two of a conſiderable bigneſs, reſting almoſt one upon another. Of which, the leſſer, by *Sylvius* and *Stenonis* is called *Conglobata*; the larger, compoſed of many glandulous Fragments, is called *Conglomerata,* and both manifeſtly demonſtrated by *Stenonis* in the Head of a Calf. Theſe Kernels ſupport the aſcending Veſſels, and becauſe they receive the ſerous Humors, ſeparated from the Arterious Blood, and ſend them down through certain lymphatic and ſalival Veſſels, and ſometimes heap together a great quantity of flegmatic Filth; hence they are vulgarly called the Emunctories of the Brain. Beſides theſe, in the Space below the lower Jaw, there are ſeveral other Kernels, wherein ſeveral Diſtempers breed, which however are not deſcribed under the Name of *Parotides,* but by *Wharton* are called *Jugulars.* Of theſe there is a great number, but all very ſmall. Nor are they ſeated only in the Neck,

but

but deſcend to the *Thorax* from the Pen-reſembling Proceſs, along the lower Seat of the Jaw, by the ſides of the *Thyroides*, between the Spine and the Pectoral Veſſels, and are ſo far conſpicuous in new born Infants, but ſcarce viſible in Perſons of mature Age. Of theſe *Steno* diſcourſes very accurately in his *Anatomic Obſervations*.

The inner Organ of Hearing.

XII. *The inner Part of the Organ of hearing is contain'd in the Proceſs of the Bone of the Temples*; partly for the ſafer Defence, to prevent the Injuries of accidental Violence, by reaſon of the hardneſs of the Place; partly, for the better preſervation of the Sound, for which, this place is moſt proper, by reaſon of its hardneſs and dryneſs.

In this lower part there are ſeveral things that occur to be conſidered; that is to ſay, ſeveral Cavities, of which four are called by peculiar Names, The *Auditory Paſſage*, the *Tympanum* or *Drum*, the *Labyrinth*, and the *Cochlea*; alſo the Membrane of the Tympanum, two Muſcles, four little Bones, the Air contain'd, and the Veſſels.

The Auditory Paſſage.

XIII. *The Auditory Paſſage is ſaid to be that ſame Den, which beginning from the Shell of the extream part of the Ear, tends toward the inner Parts, and is cloathed with a ſlender Skin and Pericranium to the very Brinks of the Tympanum.*

It aſcends ſomewhat upward with a winding Courſe, partly to prevent any thing from crouding from without into the Air, and to hinder theſe things which are ſlipt in, or gathered together, withinſide, from being carried eaſily downward. Partly, that the more vehement Impulſe of the mov'd Air may be ſomewhat broken, and ſo ſtrike the Tympanum with leſs force.

Ear-wax.

XIV. *In this Paſſage ſome yellow choleric, bitter, thick, viſcous Humors happen to be gathered together, reſembling the ſofter ſort of Wax, by the Ancients call'd* Cerumina, *and by the Greeks* κηρώδεις, *from the Colour of which reſembling Wax, the Paſſage is call'd the* Bee-hive, *or* Alveare, *and by the Greeks* κυψέλη.

The Bee-hive.

The Membrane of the Drum.

XV. Withinſide, toward the end of the Auditory Paſſage, a certain nervous Membrane, orbicular and pellucid, is obſerved; as to its Situation, obliquely looking downward, like the inner Covering of the Ear, which by reaſon of the little Nerves that it receives, and which proceed under it, feels moſt exactly, and is thin and very dry, to the end it may ſound the better, yet ſomewhat thick and ſufficiently firm, to the end it may not eaſily ſuffer damage from the Air crouding in.

XVI. *This Membrane is by* Hippocrates *called the Pellicle or little Skin of the Auditory Paſſage; by* Ariſtotle *the* Meninx; *by* Galen, *the* Covering; *but by the* Neoterics, *by reaſon of the Cavity under it, the Membrane of the* Tympanum.

Its Riſe.

XVII. *Julius Caſſerius* believes this Membrane ariſes from the Pericranium; others aſcribe its Original to the *Pia*, others the *Dura Mater*, others to the little nervous Pair of the fifth Conjugation expanded; *Bauhinus* thinks it conſiſts of its own proper Subſtance, different from other Membranes, and therefore that it derives its Original from no other, but is generated out of the Seed in the firſt formation of the Parts. Or if it muſt be ſaid to proceed from any other part, that then it ought to be deduced from the *Perioſteum*, to which in the Head of an Infant it is ſeen to ſtick very cloſe. For which reaſon, it ſeems to *Veſlingius* to be a certain Expanſion of the *Perioſtium*, who likewiſe reports the ſame to be ſometimes obſerved double, and to be frequently covered with a little Cruſt from the Excrements condenſed about it.

Its Connexion.

XVIII. It adheres to the Orbit or furrow of the bony Ring; that lyes under it, though in the upper Region of the auditory paſſage, there be a broader connexion, whence it happens to be ſomewhat bow'd in the middle, to the end the ſound may be the better and more perfectly receiv'd in that kind of Concavity.

The String.

XIX. *But to the end it may more loudly reſound, there is ſtretched over the back of a certain ſtrike like the ſtrings that goes croſs a Drum.* This the Anatomiſts generally report to be tranſverſly annexed to it. But *Julius Caſſerius* has well obſerv'd, that this ſame ſtring is neither annexed to it, nor extended under all of it, but ſcarcely under a Third Part.

Its Subſtance.

XX. *Anatomiſts are at variance about the Nature of this ſtring*; *Bauhinus* thinks it to be either a Nerve or a Ligament, or elſe a mixture of both. *Euſtachius* ſays it is a little Nerve from both the ſmall branches of the fourth

Paire. *Veſalius* affirms it to be a Nervous Body. *Volcherus Coiter* agrees with *Bauhinus*; with *Veſalius* accords *Fallopius* and *Caſſerius*; from whom *Rolfincius* ſeems not to vary.

It's Muſcles.

XXI. It is indu'd with two ſlender little Muſcles, for the motion of the ſmall Bones. Or as *Riolanus* will rather have it, to limit the bending backward and forward of the Membrane of the Tympanum. Which motion is manifeſtly perceiv'd, when the Ears are erected to hearken more attentively after any thing.

Of theſe, one which is external, ariſing with a broader beginning from the upper and more inward Cavity of the Auditory Paſſage, and by degrees becoming more contracted, and contiguous with a moſt ſlender Tendon to the Membrane of the Tympanum, is carry'd as far as the little Hammer, extending the Membrane together with the Hammer upward and outward. The way to find this out *Euſtachius* deſcribes in theſe words. Cut the Stony-bone in that place, where it is mark'd with a Line that penetrates not very deep, and riſes ſomewhat more toward the ſlenderer ſeat of the Bone of the Temples next the Inner Part, and open the Scale of it, which having done, preſently the Muſcle will ſhew it ſelf; which though it be the leaſt of all, for its conſtruction gives place to none. It ariſes from a Subſtance like to Ligaments, where the Wedg-like-bone is joyn'd with the Bone of the Temples: thence paſſing beyond the Fleſh, it becomes by degrees ſomewhat broader as far as the middle; but then growing narrower it produces a moſt ſlender Tendon, which is inſerted into the larger *Apophyſis* of the Hammer, over againſt the leſſer *Apophyſis* of the ſame.

The other Muſcle is internal, ſeated in the Stony-bone, and riſing about the Conjunction of the Stony-proceſs with the Wedg-like-bone, proceeds ſometimes with a ſingle, ſometimes with a double Tendon to the little Hammer, and higher then one Proceſs of it, is inſerted into the other Neck of it, obliquely drawing forward the Head of the Hammer, and bringing it from the Anvil to the inner Parts.

Theſe two Muſcles then chiefly draw the Membrane with the little Bones upward and downward when we deſire to excite theſe Parts to hear a thing more diſtinctly.

The uſe of the Membrane.

XXII. *This Membrane being mov'd and ſtirr'd by things ſonorous moves the Air included within, which is the Internal Medium of hearing, without the motion of which there can be no Hearing.* Which Membrane, if either from the Birth it were ſo, or by any diſtemper become thicker, or be cover'd with the ſlime of Excrements, ſo that it cannot be commodiouſly mov'd, cauſes thickneſs of hearing, or if it be immoveable from the Birth, cauſes incurable deafneſs.

The Tympanum *or Drum.*

XXIII. *The foreſaid Membrane being taken away, that large Cavity lies open, which the Modern Anatomiſts call the* Tympanum *or Drum, whoſe inner ſuperficies is unequal with ſeveral ſmall riſings and cavitys.*

The four little Bones.

XXIV. *In this four ſmall, hard, thick, little Bones offer themſelves to our Conſideration. The Hammer, the Anvil, the Stirrup, and the Orbicular Bone, which though they are deſtitute of Membranes and Perioſteums, yet about the Extremities where they are joyn'd together, to ſtrenghthen the Knots, they are bound about with a ſlender Ligament proceeding from that Ligament, which is extended thwart the* Tympanum, *like the Cats Guts under the bottom of a Drum; whence it obtain'd the Name of a String or Thread.*

By whom diſcover'd.

Theſe little Bones were unknown to the Ancients, the two firſt being diſcover'd by *Jacobus Carpus*, the third by *Ingraſſias*, *Euſtachius* and *Columbus*; and the fourth by *Franciſcus Sylvius*.

Concerning theſe, this farther has been obſerv'd by Anatomiſts, worthy notice; that in all Ages they differ nothing in ſituation or bigneſs, not leſs in new born Infants than in grown People. Only the hearing is not ſo quick in Children, by reaſon of the extraordinary moiſture of the reſt of the Parts of the Organ: perhaps alſo, for that although the little Bones have attain'd their juſt Magnitude, yet they are leſs ſolid and hard in Infants, and ſomewhat ſpungy and marrowy, as *Columbus* and *Caſſerius* witneſs them then to be.

The Hammer.

XXV. *The firſt little Bone, which either from ſome reſemblance of the ſhape or elſe from it's uſe they call the Hammer, is rivitted with a little round head into the Cavity of the Anvil*

Anvil with a looser Ligament, and thence is tap'd into the Neck. But in its farther progress it sticks close like a Tayl revers'd, to the Membrane of the Tympanum *beyond the middle of it, and about the middle it is furnished with two Processes: the one a short one, to which the Tendon of the inner Muscle is fastn'd: the other longer but thinner, which rests upon the Orbit of the* Tympanum, *and is ty'd to the Tendon of the inner Muscle of the Ear.*

The Anvil. XXVI. *The second little Bone, from the use of it called the Anvil, and resembling one of the Grinding Teeth with two Roots, lyes under the Hammer, and receives the head of it toward the upper part of it with a smoth Cavity, in the lower part it has two Processes: one a short one resting upon the hinder Cavity of the* Tympanum. *The other longer, bound to the small head of the* Stirrup *with a Ligament somewhat broad, but strong.*

The Stirrup. XXVII. *The other little Bone called the* Stirrup *from its resemblance, and answering to an Oval window both for shape and compass rests upon the* Cochlea, *to which it is fastned throughout the whole Compass with a slender and loose Ligament, so that it cannot be forc'd within the hollowness, nor rais'd up or brought forth without violence. In the upper part it is convex like a Bow, the two minute Leggs of which, being somewhat writh'd, are inserted into the Transverse Basis. But upon the Top of the Vertex stands a Minute little Head plain and round, where it is fasten'd to the Apophysis of the* Anvil, *with a Ligament somewhat Broad.*

The Orbicular Bone. XXVIII. *The fourth little Bone is very small and round; and thence call'd the* Orbicular Bone; *This is fasten'd with a slender Ligament, to the* Stirrup, *at the side, where it is joyn'd to the Anvil.* Lindan *calls it* Cochlear, *and allows it three Processes.*

The passage from the Tympanum *to the Jaws.* XXIX. *Below towards the foreparts, appears a round passage from the* Tympanum *to the Pallate, which being carry'd down, between the two Muscles of the Jaws, partly is inserted into the thick Tunicle of the Palate, near the Root of the Uvula, where the Mouth of the upper Palate ends; partly enters the Cavity of the Nostril of its own side, with a large and grisly end, covered with the slimy Tunicle of the Nostrils, like a kind of a Door-keeper; or as* Riolanus *believes, with the Ligamental Membrane enfolding the Tonsilla.* Through this the preternatural moisture collected in the *Tympanum*, flows to the Palate, and the sound rais'd in the the mouth in some measure enters the Ear. For which reason, men that are thick of Hearing, opening their Mouths and holding their breath, hear better. *Aquapendens* testifies that he has frequently obsery'd, especially in Children, the Inner Cavity fill'd with a great quantity of slime.

Fallopius and *Laurentius* hold that there is a little Skin or valve added to this passage more inwardly, looking toward the Palate and the Nostrils, and hindring the assent of vapors from the Palate and Nostrils to the Windings of the Ears; though *Riolanus* denys there is any such thing to be found. But this by reason of it's extream smallness and tenderness by better being discern'd by *Fallopius* and *Laurentius* upon the score of Reason, than seen by *Riolanus*, for reason teaches us that there must be some Obstruction to the assent of Vapors in that Channel, to prevent the Organ of hearing from being fully'd by them: but whether it be a valve or not, I dare not assert. The muscous Tunicle of the Nostrils, and the Inner soft Tunicle of the Palate seem to be sufficient for that Office: for that it affords an easie Exit to the humors descending from the Ear, but to those ascending from the Jaws or Nostrils, it gives no entrance, because it falls and is wrinkl'd into folds.

An Observation. XXX. If at any time crude excrementitious humors chance to stop in this Cavity of the *Tympanum*, the said Channel being obstructed by their clamminess, and be gather'd together in too great a Quantity, as happens sometimes in great Colds of the Head; the hearing is endamag'd, and extream pain ensues by reason of the extention of the Membrane of the Tunicle, which is often asswag'd by a violent snuffing the Air up the Nostrils, and frequent hawking: the Channel toward the Ears and Palate by that means being somewhat open'd, and the humors latent within, drawn away by a kind of sucking. Sometimes also those Humors are attenuated by the application of discussive Topics, or only by the proper heat of the adjacent Parts, and

and are reduc'd into vapors and wind, whence tingling and noiſes in the Ears, and ſo are eaſily expell'd out of the ſaid Channel. But if they have tarry'd there over long, they break forth after they have burſt the inner Tunicle, enfolding the Auditory Paſſage within ſide, to the great Eaſe of the Party in pain, and for many days together flow from the ſaid Rupture, till the Channel be free from the obſtructing humors, which done, they return to that way. But in diſtempers of the Ears, this Channel is well to be obſerv'd by the Phyſitian; for that the thick humors are ſucceſsfully drawn out of it by Maſticatories, and ſometimes forc'd out by ſneezing Powders, which not only Reaſon but Experience tells us.

The Holes. XXXI. *In the middle of the Cavity of the* Tympanum *are two holes, the bigger and uppermoſt of which, ſeated about the middlemoſt Part, and ſhut up by the Baſis of the* Stirrup, *from its oval Figure, is called the* Oval Window, *and at the hinder part opens it ſelf into the* Labyrinth *with a remarkable broadneſs. The other hole which is leſs, lower and round, is call'd the round* Window. *This always remains open, neither is it cover'd by any other Body, and is divided into two Channels, parted by a Bony Scale, of which the one together with the little* Oval Window *runs toward the* Cochlea, *the other toward the* Labyrinth.

The Oval-Window.

The Round Window.

The Labyrinth. XXXII. *The* Labyrinth *is a Cavity much leſs than the* Tympanum, *by reaſon of the bony hollowed Semicircles, covered with a thin Membrane circularly returning into the ſame Cavity, was by* Fallopius *firſt of all called the* Labyrinth; *though* Platerus *calls it the* Mine. Into this Cavity the little Oval Window opens it ſelf; beſides which, it has three other Holes makes it pervious; the one of which opens it ſelf into the end of the turning of the broader *Cochlea*, through the reſt, which are ſo very ſmall, that they will hardly admit a ſmall Hair, the diminutive little Fibres of the Hearing-Nerve to the inner enfolding Membrane.

The Cochlea. XXXIII. *The* Cochlea, *ſo called from its reſemblance to the Periwincle Shell, leſs than the* Labyrinth. *Yet is it a remarkable Cavity, concocted ſometimes twice, and ſometimes three or four times, like a Periwincle-ſhell, and covered with a moſt ſlender Film, into which, as in the former, through three or four little Holes, little diminutive Fibers of the Nerve of the fifth Pair, make their Entrance.*

This Cavity by *Fallopius*, is called the *Blind-cavity*, becauſe it has no Termination. Yet *Caſſerius* ſays, that from thence there is a Channel extended into the Paſſage of the Auditory Nerve. Of which *Riolanus* and *Rolfinch* takes notice, of which two, the one queſtions whether the Choleric Excrement of the Brain do not empty it ſelf through that Paſſage into the Ear.

Theſe Hollowneſſes, Labyrinth and Periwincle, ſays *Riolanus*, are infolded neither with any ſmall Membrane, nor ſo much as any *Perioſteum*; however the Mouths of thoſe Holes are open, to render them the more ſonorous. But in regard that bare Bones cannot be ſenſible of any Sound, there is a neceſſity for that little Membrane that deceives it ſelf from the Expanſion of the Nerve which enfolds it, and by means of which, the Motion of the Air is felt. Which diminutive Membrane, *Fallopius* has obſerv'd to be moſt ſlender and ſoft. *Whether it be an expanded Nerve*, or any thing elſe, it matters not, ſays he, *but 'tis very probable*, that this little Nerve derives its Original from the Branches of the Nerves.

Moreover, the ſame *Riolanus* writes, that theſe Cavities in new born Infants are very narrow, and that the Labyrinth is not to be diſcern'd as in Perſons of mature Age. On the other ſide, *Veſlingius* writes, that the Tympanum, the Labyrinth and the Periwincle in new born Infants, obſerving the Simmetry of Proportion, want nothing of their Perfection, for the greater Expedition of hearing in a Creature born for all manner of Inſtruction. But in the determination of this Controverſie, we muſt thus far hold with *Riolanus*; for though the three little Bones, the Hammer, Anvil and Stirrup are duly proportioned from the Birth, yet the Labyrinth is not ſo perfectly hollowed in Infants as in grown People, the Cavity of it being very ſmall.

The Innate-Air. XXXIV. *In theſe hidden Cavities, is contained a pure and ſubtil Air, which many are of Opinion is generated out of the Seed, and enters the Ear as ſoon as the Child is near the Birth, and therefore call it the Coin-gendered Air.* But in regard the Reſtoration of the Spermatic Parts is a very

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ry difficult thing, and for that this Air is continually diſſipated by the heat of the adjacent Parts, and therefore ſtands in need of continual Reſtoration, and whereas this Air has no continuous Coherence with any of the ſolid Parts, as the Spermatic Parts all cohere one with another, it can never be ſaid that this Air is detain'd in that Part as any Spermatic Part, or that it is generated out of the Seed, or put in before the Birth. And therefore ſome think it differs nothing from the external Air, only that it is more pure and thinner. Then what if we ſhould ſuppoſe it to be the Animal Spirit poured forth into the Nerve through the ſaid Cavities; for it is aereal, pure and ſubtil, like that Spirit; There is the ſame reaſon for the Generation, Preſervation and Reſtoration of both, both are ſucceſſively generated and diſſipated, the Spirit failing, the hearing grows dull, as being the internal Medium of hearing, without which, nothing can be heard. Nevertheleſs, there are ſome who affirm this Air not to be the Medium, but the primary Inſtrument of Hearing But this is far from Truth, for that the primary Inſtrument muſt of neceſſity be a living Part of the Body; ſeeing all Actions are perfected by the Help of Living Bodies. Therefore, becauſe this Air is not enlivened, nor can be numbred among the Parts of the Body, with which it has no continuous Adherence, it cannot be call'd the primary Inſtrument, but only the Medium of Hearing; and that as there is no Seeing without Air, ſo there is no Hearing without it.

Veſſels. XXXV. *There are ſeveral ſmall Arteries and little Veins which are diſtributed through the inner Organ of Hearing*, for the Nouriſhment of the Parts proceeding from the inner, and foremoſt Branches of the *Carotis*, and Jugular Vein, of which, ſundry Branches creep through the hidden parts of thoſe Cavities.

Nerves. XXXVI. *To procure Feeling, there are alſo Nerves.* The ſofter Portion of the Nerve of the fifth Pair, being carried into the hinder Paſſage of the Stony-Bone, proceeds to the *Periwinkle* and the Circles of the *Labyrinth*, to perfect the Office of Hearing. Moreover, there comes a Branch from the fourth Conjugation of Nerves, which is extended into the *Tympanum*, from which it receives the Sence of Feeling, and the Muſcles the Power to move it.

XXXVII. The uſe of all theſe Parts is to perfect the Hearing. *Uſe.*

XXXVIII. Hearing is a Sence, whereby from the various tremulous Motion of the ambient Air, ſtriking the Drum of the Ear, and together moving the internal Air with the little Fibers of the Auditory Nerve, communicated to the Common Senſory, Sounds are underſtood. *The Definition.*

XXXIX. *It is a Queſtion among ſome, whether Hearing be an Action or a Paſſion?* The more numerous Party believes it to be a Paſſion. Whom *Julius Caſſerius* oppoſing, affirms it to be an Action. But in regard there are two things neceſſary to perfect the Hearing, Reception of the Object, and underſtanding the Object receiv'd, in reſpect both of the one and the other, we believe Hearing to be both an Action and a Paſſion. For the Reception of audible Objects is a real Paſſion; but the judging of them is an Animal Action. *Whether Hearing be an Action?*

XL. *The Object of Hearing is Sound*, which is nothing elſe but a Quality ariſing from Air or Water, repercuſſed and broken by a ſuddain and vehement Concuſſion, and moving the Auditory Nerve, by the means of the implanted Air. *Sound.*

XLI. *To the Generation of Sound, two things are neceſſary, a Medium, and ſomething vehemently to ſtir the Medium.* The Medium muſt be fluid, either Air or Water, for Fiſhes alſo Hear; but no ſolid Body can be the Medium of Hearing. The vehement ſtirring Medium is twofold; either a Solid or Fluid Body. *Solid*, when two ſolid Bodies, by vehement Percuſſion, croud up the Air or Water together, ſwiftly condenſe, rapidly drive it forward and break it. I ſay *vehemently and ſwiftly*, for Bodies that joyn ſlowly and by degrees, do not break the Air or Water ſo forcibly, as to beget a Sound. *Fluid*, when fluid things, ſtirr'd with a rapid Motion, being forcibly and ſtrongly condenſed, ſtrike one againſt the other, and are broken, and ſo may be ſaid to be both the efficient Sound, as the Medium. Such a ſonorous Motion of the Air we may obſerve in Whiſtling, Thunder, and Shooting off of Guns, of Water, in great Showers and Rivers falling from Mountains. *The Generation of Sound.*

XLII. There

Differences of Sound.

XLII. There are ſundry differences of Sound, of which, theſe are the chief, Shrill, Deep, Direct, Reflex, as in an Eccho, natural, violent; from ſolid or fluid things; as alſo cauſed by things Animate or Inanimate.

The diverſity and loudneſs of Sounds are diſtinguiſhed by the four little Bones adjoyning to the *Tympanum*. For as the Membrane of the *Tympanum* is thruſt forward toward the Hammer, the Hammer upon the Anvil, the Anvil upon the Stirrup, by the Impulſe of the external Sonorous Air, more or leſs violent, Smooth or Rough, ſo upon the wider or narrower opening of the Oval-Window, by the Stirrup and Orbicular Bone, there happens a freer or narrower Paſſage of the Air included within into the *Labyrinth* and *Periwinkle*; in which Windings and Turnings, it is variouſly broken, which cauſes the ſeveral ſorts of Sounds, and thoſe according to various Impulſes of the External Air, ſometimes ſhrill, ſometimes full, ſometimes harſh, ſometimes ſweet: The Idea of every one of which Sort, is carried to the Common Senſory, by the Acuſtic Nerve, enfolding thoſe Cavities with its Expanſion, and ſo repreſented to the Mind.

CHAP. XIX.

Of the Organ of Smelling, and Smelling it ſelf.

The Organ of ſmelling.

THE *Organ of Smelling is the Noſe*, placed in the upper Part of the Body, the better to receive the Inviſible Fumes and Vapors, and to conveigh their Qualities through the Odoratory Nerves, inſerted in the inner Tunicle to the common Senſory, and repreſent them to the Judgment of the Mind, though ſome Men may be able to judge of things to be deſired or avoided, which are not to be perceived either by the Sight or Hearing.

The upper Bone, part of it is immoveable, the lower Griſtle, part moveable. The Ridg is call'd ῥάχις, or the Back; the Top ἴθμὸς, or the *Strainer*, becauſe that there the Snivel is ſtrained forth through the Sive-like Bones. The Extremity is call'd *Orbiculus*, the lower lateral Parts the *Wings*, the two larger lower Holes, *Nares* or the Noſtrils; the Partition of the two Holes, *Columna*, or the Pillar.

The Deſcription of the Noſe.

II. *The Noſe is a protuberant Part of the Face, ſerving for the Sence of Smelling, and in Reſpiration affording Paſſage to the Air, and letting down the Excrements of the Brain, flowing through the Sive-like Bones.*

Figure and Bigneſs.

The Shape and Bigneſs are well known, yet there is ſome variety in both, in reſpect of thickneſs, thinneſs, length and flatneſs, *&c.* But the better ſhap'd it is, the more it conduces to the Beauty of the Face; wherefore it is vulgarly call'd the Sun of the Face; for that as the *Sun* gives Beauty to the Macrocoſm, ſo the Noſe, *eſpecially if it be a red one*, illuminates the Face.

The Noſe conſiſts of a Cuticle, a Skin, Griſtles, Muſcles, Membranes and Veſſels.

Its Skin.

III. *The Skin is much thinner and harder than in any other Part of the Face, under which there lies no Fat.* And hence it adheres ſo firmly to the Griſtles and Muſcles, that it cannot be parted without mangling. But under the middle Partition, it is much thicker and more ſpungy, and is hairy within ſide, to prevent the drawing in of Gnats, Feathers, and ſuch other Inconveniences to the Brain, in the Act of Reſpiration. Hence this Skin reflex'd within ſide, paſſes into a Membrane, which cloaths the minor Parts of the Noſe; to which, in the upper part of the Noſe, ſome part of the hard *Meninx* paſſing through the Ethmoids Bone, is conjoyn'd, as *Caſſerius*, with many others believe, in regard that Membrane feels more exquiſitely at the upper part of the Noſtril, than at the Entrance.

Bones.

IV. *The upper and immoveable Part of the Noſe is ſupported by Bones*, and thoſe either proper, that is to ſay, two external lateral ones, and one withinſide in the middle, which divides the Noſe into two parts, or elſe common; of all which, ſee more, *Lib. 9. c. 7. &c.*

Spungy Bones.

V. *In theſe upper bony Caverns of the Noſtrils on each ſide, there is yet another certain bony ſpungy Subſtance to be ſeen, pendulous from the upper part of the Sive-like Bone*, and adhering to the ſides of the Noſe, within fill'd with ruddy and ſpungy Fleſh, which being endamaged and growing too big, are the cauſe of the *Polipus*.

VI. Theſe

The Use of the ſpongy Bones. VI. Theſe ſpungy Subſtances poſſeſs the upper Cavity, to the end they may be able to ſtop and alter the cold Air breathed in, and prevent its aſcent to the Sive-like Bone. As alſo to retard the continual and ſudden Flux of the Snivel deſcending, which would elſe be much more troubleſome than it is. Laſtly, in ſome meaſure to help the Voice, for they that have loſt theſe Bones by Exulceration, or if they be too much ſwell'd, or lengthened by the *Polypus*, theſe People all ſnuffle in the Noſe; for that the Sonorous Air aſcending through the Holes of the Noſtrils, either lights upon the Inequalities of the exulcerated Bones, or upon their extraordinary Protuberances, and ſo by the altered Motion of the Air going forth, the Voice alſo is altered and vitiated.

Falling of the Noſe. VII. In the French Diſtemper, theſe ſpungy Parts are frequently corroded by the malignant and ſharp Humors ſticking thereto, and to come away by blowing the Noſe, with bloody and ſlimy Matter; and hence their Malignity ſpreading it ſelf, to the next tender middle and lateral Bones, which being alſo eaten away, drop out by degrees, and ſo the Noſe falls, and ſometimes the Corroſion gaining Ground, lays the whole Noſe level, to the great Deformity of many a good Face.

Griſtles. VIII. *Five Griſtles conſtitute the lower moveable Part*, of which, the two uppermoſt ſtick to the Bones of the Noſe, in the lower part, where they are more broad and rugged, and thence being twiſted together, bend toward the top of the Noſe, and the farther they are carried, ſo much the ſofter they grow, and in the extream part of the Noſe, terminate, as it were in a Griſly Ligament. The third, in the middle, between theſe two, is a griſly Partition, which hangs forward from the Bony Partition, and grows in length cloſe to the two foreſaid Griſtles, in the forepart, in the inner Region. The fourth and fifth are two inferior lateral Griſtles, joyned to the two upper Griſtles with a Membranous Ligament; of which, one of each ſide ſticks to the lower part of the Noſe; and becauſe they ſtand like Wings on each ſide the Noſtrils, and move with a voluntary Motion, upward, downward, inward and outward, by the ancient Anatomiſts were called the *Wings* of the Noſtrils.

Muſcles. IX. Their Motion is perform'd by the aſſiſtance of eight Muſcles, into every one of which, two Wings are inſerted.

The *firſt*, from the upper part of the Noſe, near the Lachrymal Hole, ariſes with an acute and fleſhy Beginning, deſcending to the ſides of it in a Triangular Form, is expanded over the Wing that lies under it, and divides it by raiſing it upward.

The *Second*, carried down from the upper Bone near tothe Jaw, proceeds forward, partly into the Wing of the Noſe outward, partly into the upper Seat of the Wing that lies underneath, and ſo moves both parts upward.

The *Third*, which is very ſmall, riſing near the Root of the Wing, and carried athwart above the Wing, is inſerted into the Corner of the Wing, and dilates it, as *Veſlingius* well obſerves, though others ſay it contracts it.

The *Fourth*, like the former in bigneſs, and oppoſite to it, lies hid under the Tunicle of the Noſtrils in the inner part. This riſing from the Extremity of the Bone of the Noſe, is expanded into the Wing, and draws it together. This is much leſs than all the reſt, and is hardly to be diſcern'd, but in ſuch as have very large Noſes, in whom all theſe Muſcles are much thicker and more apparently to be ſeen.

Beſides theſe Muſcles, *Bartholinus* writes, that he has found a fleſhy thin Muſcle, extended in a ſtreight Line from the frontal Muſcle, with a broader Baſis, and by and by terminating more narrow about the Griſtle of the Noſe.

The Noſtrils. X. *Withinſide, by the Benefit of the foreſaid Partition, the Noſe is divided into two Holes, or Hollowneſſes, which they call the Noſtrils.*

Each of theſe, about the middle of the Noſe, is divided into two parts; of which, one aſcends upward to the ſpungy Bone, the other deſcends above the Palate to the Chaps, through which, all *Errhines* ſnuft up into the Noſtrils deſcend to the Mouth and Chaps, and the Snot flows out ſometimes through the Noſtrils, and the ſlimy Excrements of the Brain deſcending through the Spungy Bones, by the more vehement Attraction of the Air through the Noſtrils, are brought down to the Palate, and ſpit out, or being ſwallow'd, deſcend to the Stomach.

The inner Membrane XI. The inner large Space of the Noſtrils is lin'd with a thin Membrane, which is ſaid to riſe from the thick

Meninx, through the holes of the Sive-like-bones; or as *Riolanus* will have it, through the little holes of the Palate, and is said to be common to the Tunicle of the Palate, Tongue, Larynx and Gullet.

This Membrane, where it adheres to the Sive-like-bones, is bor'd through with little holes for the Passage of the Excrements of the Brain.

XII. *Under the Membrane lyes hid a certain peice of flesh thin, soft, and as it were compos'd of several little Teats,* which is hard to be discern'd in Men, but somewhat more easily found in Calves and Cows, though not without some difficulty. The little Teats of this peice of flesh in the fore part are less, but toward the hinder parts bunch out much bigger, and are observ'd by few Anatomists, being by some taken for small Kernels.

Vessels conveighing Blood. XIII. *For the nourishment of the Nose, there are allotted to it Arteries from the Carotides; Veins also run out from it to the External Jugulars.*

Lymphatics. XIV. *Nicholas Stenonis*, besides these Blood-bearing-Vessels in Sheep and Doggs has frequently observ'd in each Nostril a Lymphatic Vessel, arising afar off from the Kernels seated under the Tunicle of the Nostrils above the Region of the *Genders*, then joyning together into one Channel, which runs downward almost to the extream Parts of the Nostrils, and exonerates its self in the hollowness conspicuous between the Grisly protuberancy of the Wings. He is also of opinion that Flegmatic humors flow from the Nostrils through the hole which is made through the Palate into the Mouth from the foremost Parts of the Nostrils; which to me does not seem very probable.

Nerves. XV. To endue it with Feeling, and to give it motion, one Nerve of each side runs along from the fourth pair through the common hole to the larger corner of the Eye, and so proceeds to the inner Tunicle of the Nose, and the Teat-resembling-Flesh, into which it powrs forth the Animal Spirits to perfect the Sense of Smelling, and thence runs on farther to the Muscles of the same.

The definition of Smelling. XVI. Smelling is a Sense, by which things that have any Scent being carry'd to the Nostrils are understood by a Specific motion of the odoratory Organ.

Here three things are to be consider'd; the Object, the Organ it self, and the manner of Sensation.

XVII. *The Object of Smelling is Scent.* *Scent.* Scent, which is a certain Spirituous Vapor exhaling into the Nostrils from the Thing endu'd with scent, and moving the odoratory Organ this or that way.

XVIII. *Senertus* labours to prove that *Whether Smells are Substances?* Smells are no Substances, nor real Qualities, but only Species's of them. But in answer to *Senertus* we say, that no Qualities or Species's can subsist without any Body, and therefore none can be allow'd; nay there are no Odorable Species's impress'd upon no Corporeal substance that can be conceiv'd in the Imagination. This in the *Sight* is notorious; where the visible Species's are certain Modifications of the Air, depainted therein by things visible and imprinted therein, which without the Air are nothing; for Species's without Substance cannot subsist, and therefore are nothing. Thus in Smells the odorative qualities necessarily are inherent in some Substances, and because they cannot subsist without 'em, hence they are properly call'd Smells, because they are Substances endued with odorable qualities.

Philosophers commonly constitute *The efficient Cause of Smells.* Scent in dry predominating above moist. However we are to understand, that there is no Scent without Moisture, nay that it is generated out of Moisture, attenuated and rais'd by Heat. I say by Heat, because Heat is the efficient Cause which acts upon the subject containing Smell or Scent in *Potentia*; and by raising therein Fumes that are endu'd with Scent, excites Smell, out of Power into Act: And therefore Bodies endu'd with Scent smell when they are chaf'd; but growing cold they send forth no Scent, for Scent is not in act unless it exhale forth: which it cannot do nor be sent forth; while the astringent Cold binds up the Pores of the Substance containing the Scent.

Here it will perhaps be objected, that Scent is something subsisting of it self, and therefore Moisture and Heat cannot be the Cause of it. I answer that Scent or Odour is an accident subsisting in the Subject, and Latent therein, nor able to breath out of it, unless both in and with some part of its subject accompanying it; for without the Subject it is a moist vapor which cannot be rais'd, unless by Heat: and hence both Moisture and Heat of necessity concur,

cur, the first as the Subject without which it cannot be, and be perceiv'd, the other as the agent Cause without which it cannot be excited into Act. But here some one may say, that according to this Opinion, Odor of it self will prove to be nothing, and so there will be no knowledge of Odor, since there can be no knowledge of a *Non-Entity*. We grant that Odor separately consider'd, is nothing, neither does it fall under Sence; but when we consider it in and with Fume, it peirces the Sence and falls under knowledge; so far as the Accident by the Subject, and the Subject by the Accident in a mutual Order come to be perceptible. Here again some one will oppose me and urge, if Odor actually exist only in Fumes, how comes the Fish in the Water to be sensible of Odors, where there are no Fumes? I answer: 1. It may be question'd whether Fish are sensible of Odors, and whether they approach or avoid things, that carry an Odor, but are not rather lead by a grateful or unpleasing quality, perceiv'd by Savour, Sight or Feeling from other qualities diffus'd into the Water from things that carry a Scent. 2. But grant they are sensible of Odors, there is no doubt but that in the Water it self, some Fumes may be rais'd by a subtil Æthereal matter, penetrating the Water some way or other, and by its Motion causing a Heat in it: in which Fume Odorous qualities may be excited from Power into Act, and so the Fish may be made sensible of Odor, if they are sensible of Odors as they are Odors.

Difference of Odors.

XX. *There are several sorts and differences of Odors*, some are sharp, some sweet, some acid, some odoriferous, others stinking, some grateful, others loathsome, and many Odors are apply'd to the difference of Savors. Moreover Smells some are simple and natural, some by nature are in the Bodies. Others are Compounded and Artificial, such as the Perfumers make for Luxury and Delight: Others are preternatural which arise from Corruption and Putrefaction.

The Organ of Smelling

XXI. The Organ of Smelling is the Nose. Which being constituted of many and various parts, which since they cannot all officiate that particular function, it is a great question, in what part of the Nose the Smelling faculty has it's seat.

That it is not in the Blood-conveighing or Lymphatic-Vessels, nor in the Bones or Grisles is confess'd by all.

Whether by the Nerves.

XXII. *Some are of Opinion, that the Sense of Smelling proceeds from some certain Nerves peculiar and of another Nature, inserted into the Nose, and some Specific Animal Spirits flowing through those Nerves.* But they did not observe, that all the Nerves of the whole Body both in their Composition and Construction, hardly differ in any thing else, but that some are bigger, others less; some longer, some shorter, some thicker, some thinner, some softer and some harder, but that let them be what they will, their Office is the same; as being the Passages through which the Animal Spirits are conveigh'd. Moreover they did not consider that those Spirits, carry'd through whatsoever Nerves, are no way different, but of the same substance and nature, through whatsoever Nerves, and to whatsoever places or parts they are conveigh'd. Lastly, They did not observe, that the diversity of Operations, which are perform'd by their assistance, does not proceed from the diversity of them, or the Nerves that conveigh them, but from the diversity of the Parts into which they flow. Thus in the Eye they are the cause of sight, in the Muscles of motion, in the Flesh they cause the sence of Feeling. Therefore as they are the cause of Smelling in the Nostrils, there must be also in the Nostrils some specific Parts, in which by the means of those Spirits, not only the feeling, but the smell of sweet, stincking, rosy Camphory, is perceiv'd and distinguish'd.

Whether by the Papillary Processes.

XXIII. *Formerly* Galen, *and after him most Anatomists and Philosophers concluded that the Papillary Processes are the true Odoratory Nerves, and the immediate Organs of Smelling.* But we have already refuted that Opinion *Chap.* 8. where we have shewn that those Processe sare no Nerves, but Channels serving for the Evacuation of Excrements. *Vallesius* also opposes and confutes this Opinion. But *Sneider* and *Rolfinch*, finding no reason why the smelling Sence should lye in the *Papillary Processes*, add to their assistance Nerves deriv'd from the third Pair to the Nostrils. But from what has been said it is apparent that the Sence of Smelling does not lye in any particular Nerves, but in some certain specific Parts, into

which the Nerves infuſe their Animal Spirits. Which cannot be the *Papillary Proceſſes*, which neither carry Spirits, nor admit thoſe Nerves into their Body.

Whether in the Membranes.

XXIV. *Others were of opinion that the Sence of Smelling lyes in the Membrane over-ſpreading the Inner part of the Noſtrils*, and aſcribe to it a Specific Conſtitution above other Membranes, by reaſon of which it diſtinguiſhes Odors. But in regard that Membranes are the Organs of Feeling, not of Smelling, and that Feeling contributes to the perfection of the Organ of Smelling, which being depriv'd of Feeling can never ſmell, as the Eye depriv'd of Feeling can never See; and for that it is one thing to feel, another thing to diſtinguiſh the Odor of Roſes, Musk, Amber, *&c.* another thing to feel rough, ſmooth, hard, hot, cold, *&c.* it is apparent that a Membrane which is the Organ of Feeeling can never be an adequate Organ of Smelling. Nor is the Jugdment of ſome Perſons to be valu'd, who ſay, that the Membrane which over-ſpreads the Noſtrils is of another Temper and Conſtitution then the reſt of the Membranes. For if this were true, which is firſt to be prov'd, for then it might be endu'd with a more quick or dull Sence of Feeling, nevertheleſs it could never diſtinguiſh or judge of Odors. Laſtly if this were the Smelling Membrane, being of the ſame common Subſtance with the Membrane of the Palate, Mouth, Tongue, *&c.* why does it not preſerve the ſame quality of Smelling in thoſe Parts, which they aſcribe to it in the Noſtrils? *Caſſerius* thus deſcribes the Specific Conſtitution of this Membrane. *The inner Superficies of the Noſtrils is over-ſpread with a Membrane riſing from the* Dura Mater, *much different from the Nature and Temper of the other Membranes.* But notwithſtanding this Specific Conſtitution, he does not ſeat the Sence of Smelling in it, but a faculty of judging more diſtinctly of the firſt Qualities, heat, cold, and before they come to the Brain: for he ſays the Sence of Smelling lyes in the Mamillary Proceſſes.

The true Organ of Smelling.

XXV. *After all to add our own Opinion, we believe the true and immediate Organ of Smelling to be that thin Teat-reſembling-fleſh, ſeated under the inner Tunicle of the Noſtrils*, to which there is no other that is like it in the whole Body, beſides that the ends of the Odoratory Nerves enter the little Teats, of which it is compos'd, in the manner as the immediate Organs of Taſt are thoſe little Duggs which are ſeated under the Membrane of the Tongue; and the immoderate Organ of Sight is the Net-like-Tunicle. Not that I believe the Objects of each are perceiv'd in theſe Organs, but that the motion or alteration induc'd into the particular Organs by their own proper Objects, by means of the Nerves and Spirits are concern'd in the Brain and judg'd by the Mind.

The Medium of Smelling.

XXVI. *Ariſtotle* makes the Medium of Smelling to be the Air and Water, with whom moſt Philoſophers agree. But *Caſſerius* diſſents, and endeavours to prove that Water cannot be the Medium of Smelling, giving many reaſons to uphold his Opinion. But if it be true that Fiſh ſmell, as *Ariſtotle* affirms, without doubt *Caſſerius's* Opinion falls to the Ground: but if that may be queſtioned, it may be alſo doubted whether Water be the Medium of Smelling.

For though Odoriferous qualities may be infus'd into water, and ſo the water be made Odoriferous, yet the Smell is not perceiv'd but by means of the Air, while the fumes of that Water being rais'd into the Air, ſtrike the Odoratory Organs by means of that Air. For if the ſcented Water ſhould be drawn up into the Noſtrils, without the intervening Air, the ſcent of it would not be perceiv'd. Therefore it is plain that in Creatures that breath, the Air is the Medium of Smelling, and that without that Medium no ſcent could be perceiv'd. Whether among Fiſh the Water be the like Medium, and whether Creatures that do breath in Air be endu'd with Smell, we leave to *Ariſtotle* to prove.

Now the Sence of Smelling or the preception and diſtinguiſhing of Smells is thus perform'd.

The manner of Smelling:

XXVII. *The Air being inpregnated with Odors or a Spirituous exhalation of things that have a Scent, is receiv'd by the Noſe like a certain Chimney, but is not perceiv'd by the Smell, unleſs it be drawn toward the inner Parts by Inſpiration.* For without breathing in the Air, ſcarce any Smell is perceiv'd by the Noſtrils, though the Odors themſelves be clapp'd near to the Noſtrils. Therefore this motion of In-breathing is requiſite; as being

being that by which partly the Pores of the inner Membrane of the Noſtrils are open'd; partly the odorous vapors and exhalations, according to the more or leſs violent Motion, more eaſily paſſing through thoſe Pores, ſtrike more forcibly upon thoſe Teat-like pretuberances of the Dug-like fleſh, and alter them after ſome ſpecific manner. According to which diverſity of alteration, being communicated to the common Senſory by the little fibers of the Nerves of the third Pair inſerted into them, the Species of the Smell is form'd, and diſtinguiſh'd by the Mind, and hence the ſtronger the in-breathing is, the better the Scent is perceiv'd. Which is the reaſon that they who would take the pleaſure of any grateful ſmell, ſnuff up the Air with more vehemence into the Noſtrils. And they that would avoid an ill ſmell, ſtop their Noſes and forbear breathing. *Caſſerius* endeavors to prove that reſpiration ſignifies nothing to the Sence of Smelling; but becauſe it is contrary to Experience, we forbear to refute him, ſo much the rather, becauſe that the Experiment of *Gualter Needham* utterly overthrows his Opinion. For he cuting the rough Artery of a Dog in the Throat turn'd the ſame outward, ſo that the wound being cur'd, he could neither breath through the Mouth or Noſtrils, but only through that opening in the Throat: by which means the Dog could neither Bark nor Smell the moſt nauſeous Scents that were held to his Noſe.

Smelling is only in breathing Creatures.

XXVIII. ***Hence it is apparent that no Creatures can ſmell that do not breath.*** *Thomas Bauhinus* ſuppoſes the contrary: becauſe they fly the ſmell of Brimſtone, Gun-powder, *&c.* But he never conſider'd, that many Inſects breath, though we cannot perceive it. And ſuch Animals avoid ungrateful Odors becauſe offenſive, and covet others becauſe delightful, as we ſee Flys and Waſps covet dead Carcaſes, and other ſmall Inſects whoſe reſpiration is not perceptible, guided by their ſmell, ſwarm ſo far and near to the Scent of Corruption. Moreover he did not obſerve that thoſe Inſects that do not breath are likewiſe deſtitute of the Organs not only of Reſpiration but of Smelling, without which ſmells can never be perceiv'd: and therefore they do not fly the ſmell for the ſmells ſake, but by reaſon of ſome offenſive quality which burning Brimſton, and other ſtrong ſmells diffuſe into the Air, which corrode or otherwiſe torment the Bodys of thoſe Animals.

Why a Scent is grateful or ingrateful.

Now why one ſmell is grateful, another diſpleaſing, or why one ſmell is pleaſing to one, and abominated by another; ſee what we have written *c.* 24. following.

CHAP. XX.

Of the Lips, Mouth, and the other Parts of the Face in general.

The Cheeks.

THE *Parts of the Face expanded under the Eyes, between the Noſe, Ears and Chin, by the ancients were call'd* Genæ, πεφὶ τὸ γίγνεσθαι, *becauſe Hair grows upon them. Theſe* Genæ *or Cheeks, are divided into the upper and lower Part.*

The Apple of the face.

II. *The upper Part under the Eyes gently riſing and ruddy between the Noſe and the Ears is by* Hyppocrates *call'd* κύκλος προσώπε, *the Circle of of the Face, and* μῆλον, *or the Apple of the Face, in Latin* Malum *or* Pomum faciei, *from the reſemblance it has to Apples both for Colour and form.* Hence *Pliny* calls it the Seat of Modeſty, becauſe People aſham'd generally bluſh in that Part.

The Bucca.

III. *The lower and broader, becauſe it ſwells upon retention of the Breath is call'd* Bucca. In this Part when ſome People laugh, there appears a Dimple, in others a large Furrow, which *Martial* calls *Gellaſinum*, or Laughter from the *Greek* word γέλασμα. The Cavity in the Upper Lip, under the Partition of the Noſtrils is call'd φίλτρον. But the riſing part on each ſide the Cavity is call'd μύσαξ, or the *Muſtachio's.*

The Lips.

IV. *The Brims of the Mouth are call'd* Labra *or* Labia, *the Lips.* Some Grammarians diſtinguiſh *Labra* from *Labia*, ſignifying by *Labra* Lipps of moderate ſize, by *Labia* Lips of an unreaſonable bigneſs. But this is nothing at all to Anatomiſts.

Prolabia.

V. *There are two Lips, the clift between which cloſes up the Mouth.* The extram prominent Parts of theſe are called περχείλεα or *Prolabia*, and the Ruddy parts where they cloſe together, are call'd πετάμια. But the Part which

which under the lower Lip extends it ſelf till it end in a kind of blunt Point, is call'd *Mentum* or the Chin, and the fleſhy Prominency below the Chin, by the Ancients was call'd *Buccula*, by Us the *Double Chin*. The Hairs firſt appearing about this place is call'd *Lanugo*, by Us *Down*; in Perſons of more Maturity *Barba*, or the *Beard*.

Mentum or the Chin.

The Subſtance of the Lips.

VI. *The Lips conſiſts of a ſoft and ſpungy Subſtance, where the Skin is ſo exactly mixt with Muſcles, that it may be thought to be either a Muſcly-Skin, or a skinny-Muſcle.* Now this Fleſh is outwardly covered by that ſame Skin, inwardly by the Membrane continuous to the Mouth, Gullet and Ventricle.

The Veſſels.

VII. *The Branchings forth of the Nerves contribute an exquiſite Sence of Feeling to the Lips.* And the Arteries diſperſed from the Neighbouring Places between the Skin and the fleſhy Membrane, afford the nutritive Blood, to which the Lips are beholding for their ſplendid and roſie Colour, the certain ſign of Beauty and Health, with the Arteries are intermix'd little Veins, conveighing the ſuperfluous Blood to the next Veins.

The Uſe.

VIII. *Lips were given to Men, as well for the Convenience of Eating and Drinking, as for the Formation of the Voice, the Retention of Spittle, the Cloſing of the Mouth, and defending it from External Injuries, as alſo for Ornaments Sake*; for which reaſon, in Men they are covered with a Beard. And becauſe there was a neceſſity, that for the Performance of the ſaid Offices they ſhould be endued with a voluntary Motion, therefore they are alſo furniſhed with ſeveral Muſcles, of which, more in the next Chapter.

The Mouth

IX. *The Mouth, by the Greeks call'd* στόμα, *is ſometimes taken only for that ſame Cleft between the Lips, ſometimes for the whole Cavity, conſpicuous as far as the Chaps.*

It is placed in an upper Region, that is in the middle of the Face under the Noſe, to the end that whatever it receives, may not only be diſtinguiſhed by the Taſte, but by the Smell, and what is ſwallowed may more eaſily deſcend into the Stomach.

The Parts of it ſome conſtitute the Mouth it ſelf, others are contain'd in the Cavity of it.

The Mouth it ſelf conſiſts partly of bony Parts, as the lower and upper Jaw, together with the Teeth; partly, of the fleſhy Parts, as the Lips, the Muſcles of the Lips, Cheeks, and lower Jaw.

The whole inner Concavity of the Mouth is overſpread with a Tunicle; which in the Hollowneſs within the Teeth is thicker, and full of Wrinkles in the Palate; without the Teeth, in the Gums and Lips much thinner, and it is continuous to the Tunicle of the Throat and Ventricle, though in the Tongue and Palate, the Conſtitution of it is peculiar and different from other Tunicles.

The Uſe.

X. *The primary Uſe of it is, that the Nouriſhment being received into it, as into a Funnel, may be there chew'd and prepar'd, ſo as to deſcend without interruption through the Gullet into the Stomach, there to be the more eaſily digeſted.*

The ſecundary Uſe of it is to afford a Paſſage in Reſpiration to the Air paſſing to the Lungs, and Evacuation of the Excrements of the Head, Lungs and Stomach, by hawking, ſpitting and vomiting; alſo to aſſiſt the Sound of the Voice.

CHAP. XXI.

Of the Muſcles of the Cheeks, Lips and lower Jaw.

THE Muſcles of the Cheeks and Lips, are either common to both Parts, or proper only to the Lips.

Common Muſcles.

I. *The Common Muſcles are four, two of each ſide; the firſt lying hid under the Skin of the Neck, from the Shape is call'd the* Square Muſcle, *being thin and membranous, ſticking very cloſe to the Skin, ſo that the Ancients never diſtinguiſhed it from the Skin.* Thus alſo *Veſlingius* calls it the Membrane lying under the Fat, and here furniſhed with a Contexture of fleſhy Fibers.

The ſquare Muſcle.

It riſes with a broad beginning about the Clavicles, Shoulders, and hinder part of the Neck, and with oblique Fibers, is inſerted into the Chin, Lips and Root of the Noſe, which Parts it obliquely

liquely draws downward, and becauſe it moſt coheres with the Chin, therefore it is thought to contribute much to the opening of the Mouth. Sometimes it proceeds to the Root of the Ear, and where ſuch an Inſertion happens, thoſe Perſons can move their Ears by the Benefit of this Muſcle.

It receives ſeveral Branches of Nerves from the Nerves of the Neck. Therefore upon the Convulſion and Tenſion of this Nerve, the Cynic Cramp is occaſion'd, which *Riolanus* rather attributes to the Convulſion of the Buccinator.

The Fibers of it ought to be exactly known to all Chyrurgeons, as *Bauhinus* rightly admoniſhes; becauſe of Inciſions frequently required to be made in thoſe Parts, for ſome, ignorant of the courſe of theſe Fibers, and dividing them with a large tranſverſe Section, have drawn the Chaps ſometimes one way, ſometimes another.

The Buccinator.

II. *The ſecond Muſcle that conſtitutes the Chap, and is therefore call'd the* Buccinator, *lies under the foreſaid Square Muſcle, and takes up the whole Seat of the Chaps.* This is round like a Circle, and riſing almoſt from the whole length of the upper Jaw, is inſerted into the Length of the lower Jaw at the Root of the Gums; or rather circulates from the upper Gums of one Jaw, into the upper Gums of the other. For it is thin and Membranous, interwoven with various Fibers, ſo cloſely growing to the Tunicle, that overſpreads the inner Parts of the Mouth, that it cannot be ſeparated from it without tearing.

The uſe of this Muſcle is not only to move the Chaps with the Lips, but to ſtreighten them, and to force again to the Teeth, the Meat oftentimes ſliping from the Mouth into the Cheeks, for the more exact chewing of it, as alſo to cauſe Inflation, as the Chaps by their Conſtriction ſend forth with more or leſs force, the Air flowing from the Lungs, through the Lips more or leſs open. The Variety of all which Motitions toward the lower, upper, outer or inner Parts, proceeds from the manifold Variety of the Fibers, wherewith it is interwoven.

In the Center of this Muſcle, is to be found a ſtrong Ligament, as *Placentius* reports, which growing outward, and creeping through the Mouth of the Gums, ends in a ſmall ſlender Muſcle, directly oppoſite to the Chap, which Ligament however *Riolanus* will not allow of.

Muſcles proper to the Lips.

III. *Of Muſcles proper only to the Lips, there are five Pair, and one orbicular Muſcle.*

The *Firſt Pair*, riſing with a broad and fleſhie Original from the upper Jaw, where it cauſes the Cavity of the Cheeks, and furniſh'd with ſeveral Fibers, is carried obliquely downward to the foremoſt Parts, and inſerted on both ſides into the ſide of the upper Lip, and moves it upward and outward.

The *Second Pair*, riſing with a fleſhie, but ſlender and thin Original, and wrap'd about with much Fat, is inſerted into the Bridle, where the Lips meet, and aſſiſt the Motion of the Former.

The *Third Pair*, by *Riolanus* call'd the *Zygomatic*, fleſhie and round, riſing outward from the Jugal Proceſs, and obliquely deſcending along the Cheeks, terminates in the Confines of both Cheeks, which it draws away to the Sides upwards.

The *Fourth Pair*, ariſing with a fleſhie and broad Original from the lower part of the lower Jaw, at the Sides of the Chin, is inſerted into the middle of the lower Lip, and moves it downward and outward.

The *Fifth Pair*, riſing with a fleſhy and broad beginning from the ſides of the lower Jaw in a lower place, and ſometimes extended to the middle of the Chin, proceeds upward, and narrowing himſelf by degrees, is obliquely inſerted into the lower Lip near the end, and draws it obliquely downward and outward.

The *Orbicular Muſcle*, called alſo the *Conſtrictor*, which is common to both Lips, is that which conſtitutes the proper Figure and ſoft Subſtance of the Lips, and forms both Lips in the Circuit of the Mouth, and encompaſſing the whole Mouth like a *Sphincter*, and drawing the Lips mutually to its ſelf, purſes up the Mouth with orbicular Fibers, and ſticks cloſe to the Cherry Fleſh. Now all the Muſcles of the Lips are intermix'd alike, with Fibers cutting themſelves like a St. *Andrews Croſs*; whence proceeds various and ſundry Motions of the Lips.

The Muſcles of the lower Jaw.

IV. *The Muſcles of the lower Jaw, for the other is immoveable, cauſing a ſtrong Motion in the chewing of Food, are called* Maſticatory, Molary *or* Grinders, *and* Manſory *or* Eaters;

of

of which there are reckoned five Pair.

The Temple Muscle. V. The *First Pair*, being the strongest and biggest, are call'd *Crotaphytes* or *Temple Muscle*; rising with a fleshy beginning, about the Bone of the hinder part of the Head and Temples, is cover'd with the Pericranium. The Fibers of this, the farther they remove from the Middle, the more obliquely they are carried toward their *Tendon*; and hence the more it descends, the narrower and thicker it is; and at length embraces the acute Process of the lower Jaw with a short and strong *Tendon*, and strongly elevates it together with the Jaw. It receives three Nerves of each side, one from the *Third*, another from the *Fourth*, and a third from the *Fifth Pair*; by reason of which, this Muscle being bruised or wounded, great danger of Convulsion and Death ensues, especially if the Wound happen about the lower or nervous part.

The Digastric. VI. The *Second*, call'd the *Digastric*, or double Belly'd, because that being hollowed in the Middle, it seems to have two Bellies, rises near the Mammy-form Process, and about the middle where it is bow'd correspondent to the winding of the lower Jaw, it is narrowed into a tendonous Body; and thence becoming fleshy again, it is fastned more withinside to the fore and middle part of the Chin, and by drawing the Jaw downward, opens the Mouth; the too extraordinary falling of which Jaw, is also prevented by the Ligament annex'd.

The first Mansory. VII. The *Third Pair*, which is lateral, call'd the *First Mansory*, or *Eating Pair*, and proceeding partly with a fleshy, partly with a nervous Original, from the upper Jaw, and the Jugal Bone is joyned with a broad and strong Connexion to the lower Jaw, and through the Diversity of the Fibers, moves it forward, backward and sideways, and as it were, turns it round.

The second Mansory. VIII. The *Fourth Pair*, call'd the other *Mansory* and *Pterygoides*, or *Wing-like*, and the *Internal Wing-like*, which is thick and short, is produced nervous from the inner Wing-like Processes of the *Sphœnoides Bone*, and becoming fleshy, large and thicker, is carried with a broad and strong Tendon to the lower and hinder part of the inner side of the lower Jaw, which by drawing upward, assists the Action of the Temple-Muscle; also it brings the Jaw backward when turn'd outward.

The external Wing-like. IX. The *Fifth Pair*, *Pterygoides*, or *External Wing-like*, and seated in the lower Cavity of the Bones of the Temples, proceeds with a double Original, partly nervous, partly fleshy from the *Sphœnoides* and external Wing-like Processes, and after a short Course is inserted into the Neck of the lower Jaw, and the inner Seat of its Head, and moves and brings the Face forward.

Besides the foresaid Muscles, the Pair of square Muscles is properly referr'd to the Muscles of the lower Jaw, drawing the Jaw downward, which we have already described among the Muscles common to the Chaps and Lips.

CHAP. XXII.

Of the Gums, Palate, Uvula and Chaps.

The Gums. I. THE *Parts contain'd in the Hollow of the Mouth are various, among which, first occur two Gums, consisting of a sort of Flesh somewhat hard and immoveable, encompassing the Teeth like a Breastwork, and fixing them in their like Trenches.* Hence the Gum is called by the Greeks οὖλον from εἰλέω, to include or involve, as being that which wraps up and enfolds the Teeth. Hence also a Swelling in the Gums is by the Physitians call'd ἐπουλὶς.

The Palate II. *The Palate, which is as it were fortified with Teeth, by the Greeks called* ὑπερῶα and οὐρανὸς, *as it were the Heaven of the Mouth, is the upper part of the Mouth, slightly concave like an Arch, hence called* Testudo Oris, *or the* Tortois-shell of the Mouth, *form'd in the* Sphœnoides-*Bone, and extended from the Chaps to the Teeth.* It consists of Bones and a peculiar glandulous Flesh, or of small Kernels conglomerated together, and a thick Tunicle, furnished with many small diminutive Holes, sending forth the Spitly Liquor from the Glandulous Substance of the Palate, in some places full of wrinkles, continuous with the Tunicle that covers the other parts of the Mouth, whence it is vulgarly said to be common to the Throat and Ventricle, though it has a peculiar Constitution different from other

ther Tunicles, in reſpect of which, it perfects the Sence of Taſte, together with the Tongue, and to that purpoſe is furniſhed with Nerves from the fourth Pair.

Its Uſe: The uſe of the Palate is to perfect the Sence of Taſting, with the Aſſiſtance of the Tongue; as alſo to break the Voice and render it more perfect; whence it comes to paſs, that thoſe People who have this part eaten away by ſome unhappy Ulcer, taſte but imperfectly, and ſpeak with a hoarſe and ungrateful Voice.

The Uvula III. *The* Uvula, *by others call'd* Uva, Gurgulio, Columna, Columella, *and* Gargareon, *is a little ruddy piece of Fleſh, ſpungy, ſomewhat long, broad above, and obtuſely acute below, hanging forward like a Grape from the middle of the Palate near the Paſſages of the Noſtrils into the Mouth.* This *Bauhinus* and ſome other Anatomiſts think to be nothing elſe but the twice doubled Membrane, covering the inner Parts of the Mouth.

It is over-ſpread with a very ſoft and looſe little Skin, and ſwells and grows longer upon Flegmatic Defluxions, which Diſtemper is called the Falling of the Uvula.

To this *Riolanus* and *Veſlingius* attribute two Pairs of Muſcles, the Internal and External, by which it hangs, and obtains a ſlight Motion. But that their Opinion is only conjecture; the Sight it ſelf informs us, it being a moſt difficult thing to ſhew any ſuch Muſcle in that Part; and for that the *Uvula* does not want them to hang by, nor for voluntary Motion, which is never obſerved in that Part.

Moreover *Riolanus* following *Aretæus* aſcribes to the Uvula two broad Ligaments, not unlike the expanded Wings of Bats, call'd by the *Arabians Galſamach.* But theſe, like the foreſaid Muſcles, are prov'd rather by conjecture than demonſtration, unleſs they take the hinder membranous part of the Palate, from whence the Uvula hangs for Ligaments.

Its Uſe. IV. The uſe of it is manifold.

1. *To break in ſome meaſure the force of the cold Air breath'd in, from ruſhing in too ſuddenly upon the Lungs, to their great dammage.*

2. *To prevent, leaſt the Humors deſcending through the upper Parts of the Palate, ſhould fall directly in too great a quantity into the Larynx;* but that only when the Uvula is forc'd back by ſwallowing, that then they ſhould be turn'd toward the Gullet and fall into it.

3. *To hinder the Drink from running back into the Noſtrils.*

4. *It contributes alſo ſomething to the Tone of the Voice,* though *Fallopius* and others deny it: For though the Modulation of the Voice be ordered in the *Larynx*, yet the wider or narrower Exit of that modulated Voice, contributes very much to the Tone of it. Which is apparent from hence, that if a Man ſing with his Spectacles upon his Noſe, the Voice will be another thing, then when he ſings with Noſtrils open. So alſo if the Uvula by miſſing the Voice grows harſh and ungrateful, as is apparent in ſuch as have had their Uvulas eaten away by Ulcers.

5. Fallopius *believes the primary uſe of it is to moiſten the* Epiglottis *and the* Larynx, *by diſtilling upon them ſome certain lympid Liquor.*

The Chaps. V. *The Chaps are improperly taken for the whole Gaping of the Mouth; properly they denote the hindermoſt and lower ſpace, where the Extremities of the Tongue and rough Artery, and the Holes of the Noſtrils deſcending through the hinder Parts of the Palate, meet together, which is conſpicuous upon opening the Mouth and depreſſing the Tongue, and by the Greeks is call'd* φάρυγξ, *by* Galen *alſo* ἰσθμος, *and by* Hippocrates, ἰσθμιον, *by a Metaphor from the Narrowneſs; becauſe an* Iſthmus *properly ſignifies a narrow Tract of Land between two Seas:* and ſo the Uvula in the Chaps, like a Neck of Land hangs in the middle gaping of the Chaps; however they do not call the Uvula the *Iſthmus*, but the gaping of the Chaps it ſelf; whereas the Name ought to belong to the *Uvula.*

Nicholas Stenonis has obſerv'd in a Calves Head under the Tunicle, a little piece of Fleſh compoſed of glandulous Bunches, full of Lymphatic Veſſels.

The uſe. VI. *The uſe of the Chaps, is to tranſmit and ſwallow thoſe things which are taken in at the Mouth,* which is perform'd by three Pair of Muſcles, common to the Pharynx with the Gullet, and deſcribed in the Deſcription of the Gullet,

CHAP. XXIII.

Of the Hyoides-Bone.

BEfore we enter upon the Deſcription of the Tongue, we are to ſay ſomething of the *Hyoides-Bone*, which is laid under it as a Prop, for the firmer Structure of the Tongue, and to facilitate its Motion.

The Hyoides-Bone.

I. *The* Hyoides-Bone *conſiſts of ſeveral Bones, which being joyn'd together, reſemble the Greek Letter* V. *or* A. and hence alſo is called the *Upſiloides*, or the *Lambdoides*, though it be more like an *Upſilon* than a *Lambda*, in regard it is not carried about with an acute, but an obtuſe and ſomewhat round Semicircle.

It conſiſts chiefly of three Bones, very ſeldom of Five, Seven, Nine or Eleven, of which, the middlemoſt exceeding the reſt in bigneſs, large, broad, without-ſide gibbous, within-ſide ſomewhat hollowed, to which the other two are joyned like Horns. But if it conſiſt of more then three Bones, thoſe are Griſtly.

Riolanus has theſe Obſervations touching the *Hyoides-Bone*. *But the* Hyoides-Bone, ſays he, *in Women appears more ſlender and thin, and conſiſts of fewer Bones, whoſe room the Suſpenſory Productory Ligaments ſupply. Then you ſhall obſerve that only the Epiglottis is received into the Cavity of the* Hyoides, *and that the Tongue reſts upon the upper ſide of the Baſis.*

To theſe little Bones are joyned four ſmall Griſtles, which prove ſometimes bony themſelves. Two of theſe joyn to the Baſis of the middle Bone, reſembling both in form and bigneſs a Grain of Wheat. Two others are placed near the ſide Bones or Horns, and are faſtned with a nervous Ligament to the Pen-reſembling Appendix. And ſo the *Hyoides*, upon the ſides, adheres to that Appendix, on the forepart to the Target-form'd Griſtle of the *Larynx*, but chiefly to the Tongue, and receives the *Epiglottis* into its Cavity.

Muſcles.

II. *When the Tongue moves, this Bone alſo moves, and that by the aſſiſtance of eight Muſcles, which it has in common with the Tongue.*

The firſt Pair call'd *Sternothyoides*, moves it downward and backward, and riſes with a round and fleſhy Original from the upper inner Seat of the Bone of the *Sternum*, and forward ends in the Baſis of the *Hyoides*.

The ſecond Pair called the long *Coracohyoides* by the Ancients, riſes from the upper ſide of the Shoulder, near the *Coracoides* Proceſs, and in the midſt of its Body grown ſlender like a Tendon, is carry'd along obliquely under the ſeventh Muſcle of the Head, to the ſides of the *Hyoides*, and draws them obliquely downward.

The third Pair ſlender and round, ſeated under the Chin, proceeds from the extream Proceſs of the Styliform, with a round Belly, therefore call'd *Styloceratoides*, and being inſerted into the Horns of the *Hyoides*, moves obliquely upward.

The fourth Pair call'd *Geniohyoides*, drawing directly upward, and ſomewhat forward, ariſing with a large and fleſhy Original from the inner and lower Seat of the Chin, extends it ſelf to the middlemoſt Seat of the *Hyoides*.

To theſe Pairs *Fallopius* adds two more; *viz.* A fifth which riſing with ſtreight Fibers from the middle and inner part of the Chin, is inſerted into the *Hyoides*. This Pair many confound with the preceeding fourth, and look upon it to be the ſame; but others number it among the Muſcles of the Tongue.

The Sixth, which he ſays conſtitutes two little pieces of Fleſh, bearing the Reſemblance of Muſcles, which riſing from the ſame Chin, ſeem to be ſome part of them intermix'd with the firſt that moves the Tongue; but proceeding farther to the lower Parts, are inſerted into the ſides of the *Hyoides*, and draw that Bone to the Chin.

CHAP. XXIV.

Of the Tongue, the Salival Chanels, the Spittle, Taſt and Savor.

See Table XVI.

THE Tongue, by the Greeks call'd γλῶττα or γλῶσσα, by the Latins *Lingua*, is an Organic Part, the Inſtrument both of Taſt and Speech, and the aſſiſtant for the ſwallowing of Meat and

and drink, ſeated in the Mouth under the Palate.

The Shape. I. *It is oblong, broad, of a Moderate bigneſs anſwerable to the Mouth, and toward the Root of a remarkable thickneſs, but ſomewhat thinner toward the Lip.*

Its Subſtance. II. *The Subſtance of it is peculiar to its ſelf, fleſhy and ſoft cover'd with a double Membrane; the one outermoſt and thick, the other innermoſt and thin.*

The Exterior Membrane. III. *The Exterior Membrane that overſpreads the upper Surface of the Tongue, very porous, and in Men moderately ſmooth, but in moſt Brutes, eſpecially fourfooted Beaſts, very rough, and in the Superficies, divided as it were into two Parts, with a ſmall running along in the middle all the length of it.*

This Membrane is thought to proceed from the thick *Meninx*, and is ſaid to be common, to the Mouth, the Palate, the Gullet and the *Larynx*. But in regard it does not overſpread the whole Tongue every way, but only extends it ſelf along the Superficies, as far as the Root and Jaws, and does not reach either to the lower part of the Tongue, nor to the Gullet, but is only united to the inner Tunicle, and that it is apparent that it is a thicker Subſtance of another nature in the Tongue and the Palate; it is clearly evident, that it has no community with the Membrane of the Gullet and *Larynx*. For though it has not that thickneſs and roughneſs in Men, which is ſeen in Brutes, however it is thicker, and differs much from that which enfolds the *Larinx* and Gullet withinſide, which difference is apparent, for then when it is dry'd up in burning Fevers and other Diſtempers, or by exceſs of Drought, and afterwards comes to be moiſtned again, it is ſeparated and falls off three times thicker then the Membranes of the *Larynx* and Gullet. Moreover, as the Tunicles of the Eyes, Ears and Noſtrils differ very much from other Membranes, nay, from one another, though we believe they proceed from the *Menix's*; ſo this Tunicle of the Tongue, together with the Tongue and nervous little Paps, being to contribute ſome Service to the Organ of Taſt, ought of neceſſity to have ſome Conſtitution beyond other Membranes, in reſpect of which it may be enabled to contribute ſome ſpecific Service to the Taſt. Neither is it that we think the ſpecific Service here requir'd is due to any ſpecific Nerves, or ſpecific Spirits, in regard we have already prov'd that there is nothing of Specific perform'd in the Parts upon that ground.

This Membrane is very Porous, and ſuch it ought to be, to the end it may be able to ſend through the ſaid Pores in ſome part of it, to the nervous little Paps that lye under it, thoſe things which being to be taſted are laid upon it, and ſtir'd by the Motion of the Tongue. The Taſt of which things, by reaſon of its obtuſe Sence of Feeling, leaſt it ſhould be injur'd by ſharp and acrimonious Guſtables and Tactibles, it does not of it ſelf ſo quickly perceive.

The very ſame Membrane in Cows, Sheep, and other ſuch like Brutes, much thicker than in Men, is rough in the upper Region; out of which grow forth ſeveral little ſharp pointed Bodies ſomewhat griſly, of an unequal length, diſpoſed in a kind of order, moderately bow'd, and extended toward the Root, covered with a ſlender Tunicle taken from the Membrane from whence they proceed, which cauſe that Roughneſs. Which little Bodies, however in the more riſing part of the Tongue toward the Root, are much fewer, much leſs, and in ſome none at all to be ſeen. Such little Bodies of ſo large a bigneſs are not to be found in the Tongues of Men, which is the reaſon they are not ſo rough. Yet in the Year 1660. upon the Diſſection of one, who in his Life-time had been a Captain of High-way-Men, I found that Roughneſs very obſervable. For the upper Superficies of his Tongue, was as it were ſtuck with little Strings, that look'd like a kind of Down. Now the reaſon why in Brutes theſe Griſly Bodies are longer and much bigger than in Men, and why they ſtand with their Points towards the Chaps, ſeems to be, becauſe the Nouriſhment which they take with their Heads down upon the Earth, may be the more eaſily retain'd, and not eaſily ſlip out of their Mouths, while Man that ſtands upright, may without trouble hold his Food in his Mouth; and therefore a moderate roughneſs is ſufficient for the retention of his Food.

The ſecundary Uſe. IV. *But the foreſaid uſe of theſe ſmall Griſly bodys, it ſeems to be only the Secundary uſe, as that which does not require ſo large a furniture*

of little Bodies; but what is the primary uſe is much diſputed among the Learned. For in regard they are not hollow like Straws, which could never be diſcover'd by any Microſcope, they cannot diſcharge either Spittle or any other humor either into the Tongue or the exterior Parts of the Tongue, as ſome have imagin'd, the moſt acute *Malpigius* believes that theſe Bodies, by the motion of the Tongue, make a certain Compreſſion upon the Kernels in the Palate obſerv'd by *Stenonis*, and that ſo Spittle and Slime is ſqueez'd out of them, to moiſten the Tongue and the Mouth; and therefore that Nature has given to Brutes that feed upon hard and raw food, not only a thicker covering of the Palate, but has alſo order'd theſe griſly bodies growing in the Tongue to be harder and longer, that by continual rubbing the upper Parts they may more ſtrenuouſly ſqueeze out the moiſture; but in men has made the ſame Bodies more lank and flexible, where the Structure of the Palate is more looſe and ſoft, and therefore requiring a ſlighter Compreſſion to ſqueeze and force out the Moiſture. Moreover, he thinks it may be queſtioned, and that not without reaſon, whether the glutinous roots of theſe Bodies, lying under a thick covering, which are to be inſerted in the holes already mentioned, while ſtanding there ſide ways they force the little Paps, do not cauſe a Compreſſion of the humid Body inward, to the end the vellication and motion may be more violent.

The glutinous ſubſtance.

V. *Under the ſaid thick Membrane a certain glutinous ſubſtance ſhews it ſelf,* like a thick Net cheifly extended through the upper part of the Tongue, full of conſpicuous holes, among which innumerable little Paſſages of various Figures, gaping toward the outer Parts are diſcover'd with a Microſcope. Which holes anſwer to ſingular griſly horns, reſting upon the ſaid Exterior Membrane. *Malpigius* alſo has obſerv'd the traces of the ſame glutinous Subſtance in the Palate and lower Cheeks. Some have imagin'd that the Senſe of Taſting lyes in this glutinous ſubſtance; as the Sight in the Net-like-Tunicle; others that a certain Spitly moiſture is collected in it, and ſent forth through the Pores of the thick covering, into the Tongue to moiſten it. For my Part I believe it conduces to receive the Savoury Moiſture, and to retain it for the ſame time, that it may ſtick the cloſer to the little Paps, and more conveniently alter them by their Aſperity, to the end they may be the better diſtinguiſhed.

The Pap-like-Body.

VI. *Next to the ſaid Glutinous ſubſtance, lying hid under the covering of the Tongue, a certain Body appears, which* Laurentius Bellinus *has call'd the Fleſhy cruſt, but has given it no peculiar Name,* for that it has no ſimilitude either to a Membrane, or a Muſcle, or a Nerve, or a Kernel, either in color, ſtructure, or ſubſtance. This Body, as it appears in a Cows Tongue, *Malpigius* has accurately deſcrib'd.

After due examination, ſays he, *of this glutinous ſubſtance, there appears a Nervous Pap-like Body, yellowiſh and whitiſh, running cheifly along the whole Portion of the upper ſuperficies, like a Membrane, and of a conſiderable height. In this inner ſuperficies, where it is faſten'd to the Fleſh under the Tongue, it ſeems ſmooth and equal, beſides certain Nervous connexions ſtrew'd between the Fleſhy fibers of the Tongue, to which it grows; in the outer part it is unequal, for it bunches forth with Nervous little Paps diſpos'd in wonderful Order. Theſe in a Cow, a Goat and a Sheep, and alſo in Men, as to ſhape and bigneſs differ three maner of ways; ſome are bigger, cheifly ſeated at the ſides of the top of the Tongue between thoſe that are below: in the ſuperficies of the upper part of the Tongue, they are diſpos'd in a Square: In the upper Region where the Tongue looks white, they are obſerv'd to be very few: in the ſides of the Baſis there are ſome and more remarkable. Theſe in Subſtance and Shape ſeem to reſemble the Horns which Snails thruſt out and pull in. Only they have a higher Body, which having paſt the Slimy Subſtance, terminate in a round little head which is plac'd in a certain Cavity of the exterior Membrane where it grows thin. They take their riſe from a nervous and Pap-like Body, obſerving the ſame Continuity, the ſame accidents, and manner of Subſtance in both: only this they have peculiar to themſelves, that in the baſis, there is a Nervous ſhooting forth, to which they grow. Next to theſe ſucceed more numerous little Paps of another Order; for as many horns as cover the Tongue without ſide, ſo many Nervous little Paps of this ſort are to be found within ſide. Theſe*

ariſing

Fibers.

arising from the common Papillary Body, raise themselves to a moderate height, and send forth farther Nervous out-lets from the extream part of the head; which enter the Cavities cut out for them, and meet the roots of the horns: round about these innumerable Paps are to be discern'd, rising from the same place, and of the same height, but more slender, and resembling the shape of a Cone, entring their proper Cavities, form'd in the mucous substance already prepar'd, and terminating at length toward the outermost Membrane. About the root of the Basis, the Nervous little Paps bunching forth where the horns are seated, alter their shape, and being more obtuse, by and by more round and flat, the most remarkable of which are not much unlike those which are observ'd at the root of the Teeth withinside of the Cheeks. You must understand however, that the same Papillary Body, and both the Coverings underneath, though very slender, are to be form'd in the Palate, and inside of the Cheeks; with this difference that in these places the little Dugs bunch forth longer, and resembling a Conic figure: Near which are observ'd Spittle-evacuating Vessels inserted into the Kernels underneath, between which are scatter'd very small and Nervous little Duggs.

VII. Thus far *Malpigius*, who concluding writes, that the Original of this Teat-like Body is very uncertain. *Columbus* believes that it comes from the hard *Meninx*, after it has pass'd the Scull, together with the rest of the Membranes of the inner part of the Mouth: But *Malpigius* conjectures that it takes it's source from the Nervous shootings forth, dilated into the Membrane, as it happens in other Sensory Organs.

Fibers. The Substance of the Tongue, especially in Men is full of slender fibers; so that because of their slenderness some ignorant Anatomists have imagin'd that the Tongue has no fibers at all. In the Tongues of Cows, Sheep and many other Bruits of the larger size, these fibers are very conspicuous; which we have also seen in the Tongues of Men, as well raw as boyl'd. Toward the root of the Tongue these fibers are interlarded with something of Fat; and in the sides of the Basis, *Malpigius* has observ'd small Kernels like Millet-seed to be intermix'd with them.

These fibers are intermix'd one among another after so various and obscure a manner, that it is a difficult thing to demonstrate their order in situation. *Riolanus* observing them so contrary one to another and so variously interwoven; *nevertheless these two Bodies*, says he, *seem to be furnish'd with oblique, transverse and streight fibers, which are so mingl'd one among another, that it is impossible to find out what sort of fibers they are.*

But what *Riolanus* could not find out *Stenonis* believes he has attain'd. *From the Top to the Basis, we may*, says he, *distinctly demonstrate the whole Order of the Fibers, if heed be taken. The outermost fibers, next the upper Superficies, observe a direct course of the Fibers all the length of the Tongue: of the rest that are in the middle of the Body, there are only two sorts. One descending from the upper superficies of the Tongue: another in men run back from the middle towards the sides. These two sorts are dispos'd into two Orders, receiving each other alternately: of which two Orders one scarce amounts to the thickness of one Fiber.*

Thus far Stenonis: *but for my part, to confess the truth, I have long Study'd these Fibers, but impatient of the Labour I gave it over.*

The Motion of the Tongue.

VIII. *But because the Tongue is interwoven with these innumerable Fibers, and is furnish'd with various Muscles, there arises a question, by what manner of motion the Tongue, whether by its own Fibers, or Muscles or by both.* The last Opinion pleases most Anatomists. *Casserius* calls the Tongue not a Muscle, but a Musculous part. *It cannot be* says he, *but that the Tongue must move by its own proper motion, and that voluntary too, for it is mov'd after so many manners, and so many parts, that to assert its whole motion to be perform'd by Muscles alone is very ridiculous. Therefore I do not call it a Muscle, but a Musculous flesh, as participating something of the nature of Flesh, and being between a Muscle and a glandulous Flesh.*

Laurentius Bellinus, considering its wonderful variety and rapidness of Motion, says that it is a Contexture of Muscles meeting together, besides Fibers. *Riolanus* following the Opinion of *Averrhois*, besides the Motion by Muscles, ascribes to it another proper Motion, and reproves *Andreas Laurentius*, for not observing it. For that the Tongue in swift and continual Speech is mov'd of it self, and that the

the Motion of the extremity ſo extreamly ſwift is not caus'd by the Muſcles, after ſo many varieties, but only that the Muſcles make the Motion more violent. *Spigelius* obſerving ſuch a vaſt number of Fibers abſolutely pronounces it to be a Muſcle. But not one of theſe famous Men ſeems to have obſerv'd, that ſo many ſeveral, variouſly overlay'd one upon another, and interwoven Fibers, with ſo many contrary courſes can ſupply the action of the Muſcles, which is attraction ſeeing that the drawing of one Fiber, would be hindred by the operation of the other; nor that in ſuch a contrariety of oppoſitions and impoſitions, there can be any, that can do the Tongue the ſervice of a Muſcle. Since therefore Fibers only do not ſhew any part to be a Muſcle, for that the Stomack, Guts, Urine and Gall-bladders are furniſh'd with all ſorts of Fibers conſpicuous and numerous, yet are not to be accounted among the number of Fibers. The ſwiftneſs and variety of motion does not prove the Tongue to be a Muſcle, but rather to be rapidly mov'd by Muſcles, which appears from hence, becauſe the motion is voluntary. Which ſort of motion is only perform'd by the Muſcles, in that part which is no Muſcle of it ſelf. We move the extremity of the Tongue at pleaſure, but it is by the help of Muſcles, whoſe Tendons ſend out their little Fibers to that part. Nor does the ſwiftneſs of Motion prove any thnig for the contrary Party; forwe may move our Fingers as ſwift as our Tongue, and yet no man will queſtion the motion of the Fingers by Muſcles. 1. No Muſcle is made for it ſelf, but for another part of it ſelf immoveable, but if the Tongue were a Muſcle, it ought to be made for it ſelf, ſeeing it is inſerted into no Body to move it. 2. No Muſcle is inſerted into another Muſcle to move it, but other Muſcles are inſerted into the Tongue, therefore it cannot be a Muſcle.

No Kernel. IX. *Arantius* will needs have the Tongue to be a Kernel, but his proofs are not worth refuting. However *Riolanus* ſeems in ſome meaſure to agree with him, taking it from *Galen*, who ſays that the Nature of the Tongue is glandalous, and almoſt of the ſame temper. But in regard the ſhape, temper and uſe of the Tongue has nothing in common with a Kernel, this Opinion is ſo rejected

The Connexion. X. *The hinder Part of the Tongue is joyn'd to the Hyodes, the Larynx, the Chaps, the Tonſile and the Top of the Gullet, the fore Part being free from all Connexion.* In the lower Superficies it has Muſcles faſten'd to it by means of which it is ty'd to the lower Jaw. And leaſt it ſhould move beyond it's bounds, it is joyn'd to the Parts underneath it with a ſtrong Ligament. The extremity of this Ligament, being ſomewhat looſe, is call'd *Frenulum* or the *Little Bridle*; the over ſhortneſs whereof hinders the free and convenient motion of the Tongue, eſpecially in Infants. For which reaſon the Phyſitians are forc'd to order the cutting of it betimes; which Section though it be eaſy, yet great care is to be taken of cutting the adjoyning Nerves that lye under the Tongue, which may cauſe a ſuddain Convulſion of the Tongue.

Its Veſſels. XI. *It Entertains two large Arteries from the Carotides, and ſends forth two Veins to the inner Branch of the external Jugulars, called the* Frog Veins, *remarkably conſpicuous under the Tongue, from whence we often take away Blood in Diſtempers of the Chaps.*

Nerves. XII. *It admits two Pairs of Nerves.* Of which the thinneſt that proceeds from the fourth Pair, is carry'd along quite through the Subſtance of the Tongue, and thruſts its extremities into the Nervous little Dugs, affording alſo ſome little branches to the Nerves, powring forth Spirits to perfect the Sence of Taſting. The others, which is thicker, proceeding from the Seventh Pair, enters the Muſcles of it, and by means of the Animal ſpirits gives it the faculty of Motion.

Note here, that beſides that the Tongue is divided into the right and left ſide, by a Line running through the middle of it, none of theſe Veſſels are carry'd from the right to the left, nor from the left to the right ſide of the Tongue. Whence *Galen* pronounces this Inſtrument to be twofold like the Organs of Sence and Hearing. This Duplicity of the Tongue is chiefly conſpicuous in Serpents, Vipers, Lizards, Sea-Calves, and other ſuch little Creatures, whoſe Tongues ſeem to be divided into two or three Parts, therefore call'd ſometimes double, ſometimes treble Tongu'd.

XIII. *Upon*

The Epiglotts. XIII. *Upon the hinder part of the Tongue, rests the Epiglottis Grisle, otherwise call'd* Lingula *or the little Tongue.* vid. l. 2. cap. 15.

The Tonsils. XIV. *At the Root of the Tongue appear two small Kernels call'd* Tonsillæ *of which,* vid. l. 2. cap. 15. Also a peice of Flesh consisting of several small Kernels and Fat, seated under the Chin and Tongue, between the *Hyoides* and the Muscles of the Tongue; a glandulous piece of Flesh like which takes up the whole Region of the inside of the Cheeks; which small Kernels or Kernelly-pieces of Flesh gather together the Spittly Humor to moisten the Tongue and Mouth, and discharge it as well through the Lymphatic or Salival Vessels, as through the small Holes of the thicker Membrane of the Mouth, especially when the Mouth and Tongue move. And therefore when the Nourishment is chew'd in the Mouth, the Liquor press'd out of these small Kernels by the masticated food partly of its own accord flows in greater quantity into the Mouth, to be mix'd with the Nourishment toward Fermentaceous preparation, and to render the swallowing more easie. But in time of sleep when the Mouth does not move, it ceases: which is the reason that they who sleep with their Mouths open are generally a dry for want of this Liquor.

Its Muscles. XV. The Tongue is mov'd every way, partly by the assistance of those Muscles, which it has in common with the *Hyoides*; partly by Five proper Pairs of Muscles.

The first by the Ancients call'd *Stylogloſſum*, from it's Pen-resembling Appendix, arising with a narrow and tendinous Original, is inserted about the middle into both sides of the Tongue, and both raises it and carries it inward. But about the Root of the Tongue it so intermixes its Fibers with the Fibers of the Muscles, moving the Tongue downward, that you would think the Pair to be united with them. This Pair in Men is slender, but in Cows double, fleshy and thick.

The Second Pair call'd *Basiogloſſum*, and *Upsitogloſſum* proceeding from the Basis of the *Hyoides* ends in the middle of the Tongue, and depresses it by drawing it in a streight Line inward.

Geniogloſſum. XVI. The Third Pair which is call'd *Geniogloſſum*, rises in the inner seat, about the middle of the Chin, and being inserted into the lower part of the middle of the Tongue, thrusts it forth. This, as also the preceeding Pair has several little Lines in it, as if they were several small Muscles. *Vesslingius* reckons this Pair among the Muscles of the *Hyoides*, and asserts them to be inserted into the Basis of that Bone.

Ceratogloſſum. XVII. The Fourth Pair rising from the Horns of the *Hyoides*, and thence call'd *Ceratogloſſum*, is inserted into the sides of the Tongue, where it mixes its Fibers, with the Fibers of the First Pair, and moves the Tongue if both act together, directly downward toward the inner Parts: but only one or the other act at a time, it moves the Tongue to the right or left side.

Myloglosſum. XVIII. The First Pair call'd *Myloglosſum*, rises at the sides of the lower Jaw, at the Roots of the hinder Grinding Teeth, and is inserted under the Tongue into the Ligament of the Tongue, and draws it downward.

The little Kernels. XIX. The Muscles being remov'd, besides the two oblong and round little Glandules lying near the begining of the Gullet, several other little fleshy Kernels, as it were a knot of several little Kernels, furnish'd with Lympatic Vessels, small Arteries and Veins, and diminutive Fibers of Nerves, which are seated under the Tongue about the Bridle, affording continual moisture to the Tongue, from the small Lymphatic Vessels.

The Spittle Channels under the Tongue. XX. Moreover on each side, from a great and remarkable Kernel, resembling the Sweet-bread of a Man, seated above the middle Tendon between the Flesh of the double belly'd Muscle, proceeds a certain Channel, from its use call'd the *Salivary Channel.*

This Channel, though not unknown to the Ancients, was lost again for many Ages, till of late again discover'd by *Glisson* and *Wharton*; whence Modern Anatomists ascribe the Discovery of it to them.

But that these Channels were known to the Ancients, appears out of *Avicenn*, who thus describes them; *Under the Tongue are two Orifices, both which a small Bodkin enters, and they are the Fountains of Spittle, which reach to the Glandulous Flesh, which is in the Root of it, and are call'd the* Generatives *of the Spittle; and those two Fountains are call'd the*

Powrers

Powrers *forth of the Spittle, and preſerve the Dew that moiſtens the Tongue.* The ſame is apparent from *Galen* in theſe Words. *Becauſe the Tongue being dry, becomes more ſlow in its Motion, therefore Nature wonderfully provides for it, to prevent its being injur'd by any ſuch Annoyance. For ſhe has placed two fleſhy little Kernels in the Larynx, like a Spunge, one of each ſide, which ſhe has alſo done in the Tongue. From thoſe Kernels adjoyning to the Larynx, certain Channels diſcharge the Spitly Humor through the oblique and lower Paſſages into the Parts under the Tongue, moiſtning the Tongue it ſelf:* Which *Haly* alſo and *Carpus* both obſerve.

Subſtance and bigneſs. XXI. Both theſe Channels, in form and ſubſtance are not altogether unlike the Veins, but ſomewhat more tranſparent, with a Hollowneſs, which in Men and Calves admits a ſmall Bodkin, but in Dogs is very ſtreight, though in ſome larger, in ſome narrower.

Situation and Original. XXII. *One of each ſide riſes from the ſaid Kernel, with many ſmall Beginnings meeting together in one Channel.* Aſcending obliquely upward from the Kernel, it is carried almoſt as far as the middle of the Jaw, between two ſmall Kernels there ſeated; which having paſſed by it proceeds ſtreight forward near the Nerve of the ſeventh Pair, which at length it paſſes by, and ſo terminates ſomewhat toward the foreparts, diſtant about a Fingers breadth from the Teeth, and opens into a peculiar Kernel (called the *Frog-Kernel*, or *Hypoglottis*) covered with a thin and porous Membrane, which is ſeated under the Tongue, one upon each ſide of the Bridle, near the Frogg veins between the Fleſh, which joyns the Tongue to the neighbouring Parts, and the Kernels under the Root of the Tongue. Theſe two Kernels, are as it were two ſoft ſmall Spunges, ſucking in the ſpitly Humor from the firſt Channel. In Brutes, by reaſon of the length of the Jaw, the Channel is longer.

The Frogg-diſtemper. XXIII. If in Men it happen that the Pores of the Membrane under the Tongue are too much cloſe, or that the Spitly Liquor be ſo condenſed, that it cannot paſs through the Pores, and flow into the Mouth, then the Collection of much Spittle cauſes a Swelling under the Tongue, which the Phyſitians call the Frogg-Diſtemper, which increaſing, cauſes a great Obſtruction in Speech and Swallowing, but is eaſily cured by Inciſion of the Membrane under the Tongue.

Stenonis's Ducts. XXIV. Beſides, the ſaid Spittle-Channels, there are yet other two of each ſide, one ſhew'd in the *Anatomy-Theatre* at *Leyden*, by *Jo. Van-Horn*, *Anno* 1661. which he then call'd the *Stenonic Channels* from *Nicholas Stenonis* the *Dane*, the firſt Diſcoverer.

Their Original. XXV. They derive their Original from a large Kernel, ſeated at the Root of each Ear, which *Stenonis* calls the conglomerated *Parotides*; from which, being diſſected many little Branches ſpring forth, and are diſcerned running forth into theſe Channels.

In theſe Channels, *Stenonis* obſerves, beſides the proper Tunicle, ſeveral nervous Strings embracing the middle Channel.

A Phyſical Obſervation. Sometimes it happens that theſe Salival Veſſels about the Cheeks being bruiſed, the Lymphatic Salival Liquor flowing in great abundance from the Wound, hinders the cloſing of it. Thus a Noble-man of *Nimmeghen* being wounded in the middle of his Cheek with a Drinking-Glaſs, thrown at his Head, the Wound was almoſt cloſed by the Chyrurgion, but for a long time a Lymphatic Salival Humor, weeping from a little Hole in the middle of the Cheek, by reaſon that the Salival Channel, then unknown to the Chyrurgion, was burſt by the Blow, kept the Wound open for two Years, which at length was cur'd by my Advice, upon the Application of an actual Cautery, which ſtopt the flowing of the Salival Humor. *Aquapendens* alſo tells us of an Accident of the ſame nature, which we alſo ſaw in a certain Cook at *Utrecht*.

Other Salival Veſſels. XXVI. *Theſe Salival Veſſels already deſcrib'd, are more conſpicuous. But beſides theſe, there are a great many others of leſſer note in the Mouth, eſpecially in the Palate and Cheeks, which have hitherto lain hid inviſible*; but the Paſſage of the Spittle from thoſe Parts teaches Us, that the Spittle diſtils from ſeveral ſmall Kernels ſeated within the Membrane through ſome ſuch little Veſſels, or the Pores of the ſurrounding Membrane. Through the cloſing of which Pores, the Salival Liquor being detained within the Membrane, many times little Swellings ariſe without Pain. Sometimes in the inſide of the Cheeks, ſometimes in the Palate of the Mouth,

which

which either break of themſelves, with much Spitting, or elſe are opened with a Chyrurgions Inſtrument.

Des Cartes his Opinion.

XXVIII. *Des Cartes* ſeems to have been ignorant of theſe Veſſels, and therefore deduces the Original of Spitle from the Stomach, and ſays, that certain Particles of Arterious Blood fall into the Stomach and Guts, where they do the Office of *Aqua-fortis*, in aſſiſting the Concoction of the Nouriſhment, from which, becauſe they are very hot, certain Vapors aſcending through the Gullet into the Mouth, thicken there into Spittle. But in regard that the Salival Juice manifeſtly deſcends from the Head and Kernels, and whereas in a great Heat of the Body, hot Blood flows to the Stomach and inteſtines in greater quantity, and yet the Mouth is not for all that the more moiſtned, when dry and parch'd up, when at that time the greater quantity of Vapors aſcending to the Mouth, ſhould cauſe the more moiſture in the Mouth; whereas alſo, whatever aſcends from the Stomach, cauſes rather Puking and Vomiting, which never happen in the increaſe of Spittle; and laſtly, ſeeing that in cold and flegmatic Perſons, in whom the Arterious Blood is colder, and flows in leſs quantity to all the Parts, and conſequently into the Stomach, which is the reaſon that fewer Vapors aſcend from the Stomach to the Mouth, and yet ſuch Perſons abound in Spittle, all theſe things fully demonſtrate, that the Opinion of *Des Cartes* touching Spittle, is but a Fiction.

The true Original of the Saliva.

XXIX. It remains therefore unqueſtionable, that the Salival Liquor does not aſcend through the Oeſophagus; but is diſcharg'd into the Mouth through the aforeſaid Salival Veſſels. But in regard the Liquor of thoſe Veſſels is carry'd in a very great quantity to the Mouth; the Queſtion is, out of what Veſſel that Moiſture is ſeparated and carry'd to the ſaid Kernels of the *Parotides* and ſmall Kernels, from thence to be diſcharged through the Salival Veſſels into the Mouth? *Wharton* aſſerts, that it flows out of the Nerves. But in regard they are not hollow enough to give Paſſage to ſo great a quantity of Liquor, this Opinion cannot be true. Some would bring it from the Chyle-bearing-Veſſels. But in regard thoſe Veſſels do not run out ſo far; and becauſe that the Chylus were it carried thither, might be concocted to a greater Perfection, but not be chang'd into another leſs nouriſhing, or more fermentaceous Humor; this Opinion alſo ſtands upon no bottom. *Deuſingius* believes it is diſcharg'd out of the Lymphatic Veſſels, and ſo comes into the Mouth. Which Opinion, though ſomething more probable; but becauſe the Lymphatic Veſſels do not pour their Juice into the Kernels, but draw it from thence to be carry'd to other Parts, neither can this Opinion be true. Beſides, there is no queſtion, but that the *Lympha* and the Spittle, though they differ in thickneſs, have the ſame Original both from the Blood; and therefore ſeeing this Liquor cannot be ſeparated from the veiny Blood, as being that which flows from the Kernels and other Parts, it remains, that it muſt be ſeparated from the Arterious Blood; for that the Arteries, as they pour forth nouriſhing Blood into all the Parts, ſo likewiſe into the Kernels; the more ſaltiſh Salival Part of which, apt for the Nouriſhment of the Kernels, through the mixture of the Animal Spirits flowing through the little Nerves, is ſeparated from the reſt of the Particles, and in them is concocted ſomewhat after a ſpecifical manner, and farther prepar'd, and the Overplus of their Nouriſhment having obtain'd a kind of ſlight ſowriſh Quality in the Glandules, flows through the Salival Veſſels into the Mouth. And indeed you may diſcern certain Arteries in theſe Kernels gaping into the Kernels with ſmall diminutive Holes, and through thoſe diſcharging a ſerous Liquor into the Glandules. And this Opinion is confirm'd by great Salivations, whether ſpontaneous or provok'd, at what time ſuch a vaſt quantity of Spittle is diſcharg'd, which could never be ſupplied by the Nerves, or any other Veſſels, but the Arteries.

The Definition of Spittle.

XXX. *Now then Spittle is a Liquor ſlightly Fermentaceous, Serous and Lympid, ſeparated from the Arterious Blood in the Parotides, and various Kernels and glandulous Caruncles, and diſcharged into the Mouth through the Salival Veſſels and other Salival Paſſages.*

The Qualities of Spittle.

XXXI. *Concerning the Qualities of Spittle, we find but little written by others, which nevertheleſs if diligently conſidered, ſufficiently demonſtrate, that it is not a ſimple Body, but compounded and ſlippery, leſs fluid than Water, but thicker and more viſcous.* It derives not its Frothineſs

from its self, but from the Air and Tongue. In sound People, it has neither Savour nor Taste of it self, which in sick People it sometimes acquires, from the bad Temper of the Humors it self, or the mixture of other ill Humors, and sometimes from the Savor and Taste of the Nourishment received.

Its strange Composition.

XXXII. ***It would be a difficult thing to give an exact Accompt of its Composition, which is very wonderful.*** For it is easily mix'd with all sorts of Nourishment, dry, moist, oyly, salt, sulphury, *&c.* For it mixes with all things received into the Mouth. And when out of our Bodies, it will mix with Quick-silver; whereas other more simple Heterogeneous Humors, Water, Spirits, Oyls, Salts, and other mixed Humors will not associate, which Salt will do, and not only mix with, but unite them all together. So that it seems to be the universal Internal Menstruum, by means of which, all things receiv'd into the Mouth, are united together, and descend with it to the Stomach, to promote a more exact dissolution of the swallowed Substances. Whence *Francis de le Boe Sylvius* conjectures, that it contains in it self much Water, somewhat of volatil Spirit, least of Laxivious Salt, with a very small quantity of Oyl and Acid Spirit, mixed and tempered one with another.

Its Use.

XXXIII. ***As to its Use, it is manifold and very remarkable.***

1. Being mixed with the Meat chewed in the Mouth, by its slipperiness it facilitates Swallowing, which can hardly be done without it, as is apparent in dry Fevers, and other Accidents that cause Drought.

2. It draws from the drier sorts of Meat a sapid Salt, which could never be drawn forth without moisture.

3. It quenches Thirst, which is the reason that they who spit much, are seldom adry.

4. It renders slippery, the inner parts of the Mouth, the Chaps, the Organs of Speech, and the Gullet.

5. In the Stomach it promotes the Fermentation of the Nourishment receiv'd; nay, it is their primary Ferment, containing all things in it self to perfect that Fermentation, that is to say, some slight Acidity tempered with a volatil Spirit in a great quantity of Water. Which fermenting power appears from hence, for that if a piece of White-bread chewed and moistned with much Spittle, be mixed with Dow kneaded with Luke-warm-Water, it will cause it to ferment.

The Difference between the Saliva and Sputum.

XXXIV. However, there is some difference to be observ'd between *Sputum* and *Salivam*; by *Sputum*, the Physitians mean that tenacious Humor, the Superfluity of which, becomes troublesome in the Mouth, as happens in Defluxions of Catarhs, or such as is generated by some Corruption of the Spittle, or is coughed up by the Lungs. By *Saliva*, they understand the natural Liquor, not superfluous in healthy People, nor to be spit out, but necessary for the moistning the Mouth, the Mixture of the Nourishment, and its Preparation and Fermentation for Concoction.

There is also some difference between Spittle & that Snot which falls down from the Brain through the Sive-like-Bone, and is partly discharged through the Nostrils, partly descends to the Chaps, through the hinder Parts of the Palate. Not that these Humors differ in respect of their Original; but for that the Snot, by reason of its longer stay by the way, obtains another quality besides it, before it comes to the Mouth, and hence it becomes thicker, more tenacious, yellowish, and sometimes otherwise, ill colour'd. Which Qualities nevertheless, when it has not, then it differs little from the Salival Humor, and moistens, and renders slippery the Chaps, Gullet, and adjoyning Parts, and being mixed with the Nourishment in the Stomach, promotes Fermentation in like manner as the Spittle. This Liquor, when a Man is in Health, is fluid and thin in the Ventricles of the Brain, not like the Spittle in the Mouth, but almost like the Lymphatic Humor contained in the Lymphatic Vessels, and by reason of its being so thin, easily slides down through the small Holes of the Sive-like-Bone, into the spungy Bones of the Nostrils, wherein, if it stay long, by reason of the Passage of the cold Air breath'd in and out, it frequently becomes thick, colour'd and endu'd with other Qualities; as the Lympha gathers out of Lymphatic Vessels near the Liver, and other Vessels near the *Cochlear*, grow into Gelly through the cold Air, and sometimes becomes yellow, sometimes of another Colour. So that these two Liquors differ little or nothing from the Lympha, and this same Snivel and Spittle may well be call'd the Lympha carried to the Mouth.

XXXV. *The*

The Action of the Tongue.

XXXV. *The primary Action of the Tongue is to taſte,* for which it ſeems to be chiefly form'd; the ſecundary end is for Speech and Swallowing.

Definition of Taſte.

XXXVI. *Taſting, is a Sence by which the guſtable or reliſhing Qualities of reliſhable Bodies are diſtinguiſh'd in Moiſture by the Organ of Taſte, through the Motion of the Tongue and the adjoyning Parts.*

Diſtinction between Taſte and Feeling.

XXXVII. *This Sence many confound with Feeling;* following the Opinion of *Plato*, and make it a Species of Feeling, but erroneouſly; for though Feeling conduces to the Organ of Taſte, yet Taſte and Feeling differ, both as to the Organ and the Object. For the Organ of Feeling is a Membrane; the Organs of Taſte are certain nervous little Teats, ſprouting out from the ſecond thin Membrane of the Tongue, the like to which are not to be found in the whole Body beſide. The Objects of Feeling are all manner of tangible Qualities, hard, ſoft, cold, hot, *&c.* The Objects of Taſtes, are Reliſhes. Moreover, the Taſte may be loſt, yet the Feeling remain entire; thus many ſick People can reliſh nothing of Savour, but they can at the ſame time feel a Prick or a Burn, or Cold, or the like.

For which reaſon we muſt conclude, that the Sence of Taſting is a Sence peculiarly diſtinct from that of Feeling; as the Sence of Sight is perform'd by the Eye, which is endued with the Sence of Feeling, and yet ſight is altogether diſtinct from Feeling.

No Medium of Taſte

XXXVIII. *From what has been ſaid; it is alſo apparent, that there is no Medium of Taſting:* Seeing that Taſting is performed when the reliſhable Bodies immediately touch the reliſhing Organ, and hit upon it.

The Organ of Taſte.

XXXIX. *The primary Organ of Taſte, is the Tongue, or ſome parts of the Tongue.* But being compoſed of various Parts, Fleſh, Membranes, Nerves, Kernels, nervous Teats, *&c.* the Queſtion is, in which of theſe the Sence of Taſte is ſeated?

Whether in the Fleſh of the Tongue?

XL. *The* Ariſtotelics, *whom* Bauhinus, Veſlingius, Deuſingius, Bartholine *and others follow, affirm it to lye in the fleſhy part of the Tongue, which is therefore Spungy and Porous.* Partly for the more eaſie entrance of the taſtable Moiſtures; partly to contain a Specific Liquor for the Perfection of the Taſte. As to perfect the Hearing, there is required an Air within, and an Air without. But in regard the fleſhy Parts over the whole Body only feel and diſtinguiſh tactible Objects, never guſtable Objects, as bitter, Salt, *&c.* nor ſo much as feel them as ſuch, ſhall the Tongue alone, by means of its fleſhy Particles, endued with Nerves and Membranes, be able to judg of Taſtes likewiſe? But you will ſay the Tongue is more ſpungy then the Heart, Reins, Muſcles, and other ſpungy Parts, and therefore more eaſily admits the Guſtable Humors within its Pores, which the thickneſs of the other fleſhy Parts will not admit: to which I anſwer, let them view the Tongue more conſiderately, and they will find the Tongue leſs ſpungy than the muſcly Fleſh. Beſides, there is no Senſe in the Pores, but in the Subſtance it ſelf of the fleſhy Parts that are ſenſible. Hence, when a ſalt or bitter Sweat, as in the Jaundice, paſſes the Pores, and twitches their Subſtance more or leſs, they feel it indeed in their Subſtance, as ſoft or painful, but not as ſalt or bitter. The Reins and Lungs are alſo looſe and ſpungy, wherefore are not they alſo endued with the Gift of Taſting?

Whether in the Membranes or Nerves?

XLI. *Others, with* Laurentius, *ſeat the Senſe of Taſting in the Membranes of the Tongue.* But the Membranes of the Tongue, like all other Membranes, only perceive by feeling what is hard or ſoft, hot or cold, *&c.* but they diſtinguiſh Savours no more then the Membranes of the Eyes or Ears. And the ſame reaſon there is to be given for the Nerves. To ſay the Nerves and Membranes of the Tongue are of another Nature and Conſtruction then others, ſignifies nothing; for that the difference of Conſtruction can produce nothing elſe, but a more obtuſe or quicker Sence of Feeling, but nothing of Taſte or Judgment of Savors.

As to the Blood-bearing Veſſels, there is no thought that the Taſte ſhould lye in them.

Whether in the Kernels?

XLII. Wharton *believes it lies in the* Tonſils, *others, in all the Kernels ſeated in the Mouth and round about the Tongue.* But in regard the Taſte is moſt accurate at the Tip of the Tongue, remote from the *Tonſils* and other Kernels, and more dull at the Root of the Tongue, where the *Tonſils* and many other Kernels lye; and ſeeing that the Taſte is a peculiar acute Sence, requiring an acute Specific Sen-

ſory, whereas the Glandules are dull of Sence, and contain nothing for the perfection of Taſte, nor ever were obſerv'd to diſtinguiſh Savors, I ſee not how this Opinion can be defended.

Whether in the Nervous Teats?

XLIII. ***The laſt things to be conſidered, are the nervous little Paps,*** into which ſeveral ſmall Branches of Nerves, riſing out of the Subſtance of the Tongue it ſelf, are inſerted and covered with a thin Porous Film, and being endued with a peculiar Subſtance, I believe the Sence of Taſte to be brought to Perfection, by the help of the foreſaid porous Pellicle, or ſlimy fleſhy Cruſt, environing them like a Net, and abſolutely affirm it to be true. 1. Becauſe in what part of the Tongue theſe little nervous fleſhy Bags are moſt numerous, as at the Tip, in the Sides, and upon the Superficies, there the Sence of Taſting is moſt ſwift, moſt acute, and moſt exact; where they appear leſs numerous, the Sence of Taſting is more dull; and where there are none at all, as underneath between the Tip and the Bridle, there is no Taſte at all. 2. Becauſe in thoſe parts of the Palate where thoſe Fleſh-baggs lye hid under the thick Membrane, the Taſte has its Operation. Which is eaſily made out, laying a little Aloes or Salt, now to one, now to another part of the Tongue, by which you ſhall eaſily diſcern the Difference of the Taſte; in one place more quick, in another duller, in another no Taſte at all, according as the Places are more or leſs furniſhed with Fleſh-bags, or want them all together. Beſides, if we more diligently inſpect the Subſtance of the Fleſh-bags it ſelf, we ſhall find in it ſomething abſolutely ſpecific, which we may admire, but never be able to explain.

The manner of perception of Savors.

XLIV. ***Nor are we leſs unable to unfold by what means the Perception and Diſtinction of Savors is perform'd by thoſe little nervous Fleſh-Bags, then how their Sight or Hearing are cauſed by their particular Organs.***

But then another Queſtion ariſes, how it comes to paſs that one and the ſame Taſte, for Example, Sweet, or Bitter, always offers it ſelf in the ſame manner. This happens, becauſe the Taſtable Salt ſtrikes into the Pores of the little Fibers of thoſe ſmall Fleſh-bags, with its Particles conſtituted after the ſame manner, and in the ſame form, which Impulſe, by means of the Nerves, is preſently communicated to the Mind. So that as long as thoſe Particles of Salt have the ſame Proportion of Meaſure to the little Pores of the ſmall Fleſh-bags, they communicate the ſame Savors. But if the Conſtitution of the Particles of Salt be alter'd by the Mixture of ſome ſulphury or other Humor, ſo that the Particles which before were ſtiff, hard, and pointed, become flexible, ſoft or round, then the little Fleſh-bags and Nerves come to be otherwiſe affected, whence the Alteration of the Reliſh, and another perception of the Taſte.

Now the Agitation and Motion of the Tongue, is that which chiefly ſtrikes the Guſtable Bodies into the little Fleſh-bags, by which Motion being forced into the Fleſh-bags, they alter them after a Specific manner, and imprint the Species of the Reliſh into them with their ſharp Points and ſlender Aſperities, to be communicated to the Mind by means of the Nerves. Which Species ſometimes fixes within them, when the ſaid Bodies being more violently forced into them, and by reaſon of the unequal Proportion of the Particles of Salt to the figure of the Pores, cannot be got out or waſhed away by the Spittle.

Various Opinions about Savors.

XLV. As to the great Diſputes what Savor is, and wherein it conſiſts, *Ariſtotle* affirms it to be nothing elſe but a certain Quality in determin'd Compounds, ariſing from the Mixture of the Elements; but what that Savory Quality is, he leaves in the Dark. In another place, he believes it to be ſomething ariſing from Water and Earth, being mixt together, the Heat of Fire concurring. For though Water be of it ſelf inſipid, yet it is capable to receive any Reliſh, and ſo, as the Fire variouſly acts upon that and the Water, the diverſity of Savors ariſes. But in regard that Fire contributes to Water only Heat, Attenuation and Diſcuſſion, and Drineſs and Hardneſs to the Earth, this Opinion muſt fall to the Ground. Nor does *Galen* determine any thing certain concerning this Matter, when he ſays that Savor is a Water intermixed with ſome dry Body by the Operation of Heat. In which Sence, *Alſtedius* will have it to be a Mixture of the Watry Humid, with the dry Terreſtrial. Others alledg that the Stupid quality is the certain Figure, Magnitude and Motion of the ſmalleſt Particles. But ſeeing they never explain in what things that Figure, Magnitude and Motion ought to be conſidered, and how

Savor

Savor proceeds from them, they leave the Matter as obscure as they found it.

What Savor is?

XLVI. *Now therefore to deliver our own thoughts, 'tis our Opinion that Savour is not any Specific flowing out of any things, but a certain Specific suffering imprinted by the Asperities of certain things into the Organs of Taste, the Perception and Judgment of which suffering is the Taste.*

Whence the Asperities come?

XLVII. *Now we believe, that the foresaid Asperities and their diversities are to be fetch'd from the Principles of the things themselves, as, Salt, Sulphur, Mercury,* &c. *concerning which,* See l. 2. c. 12.

The sapid Asperities.

XLVIII. The Asperities causing Savor consist in Salt, which as it is variously mix'd, concocted and united with Sulphur or Mercury, the Asperities are greater or lesser, more pointed, stiff, hard, pricking, or more flexible, soft, or smooth: which diversity begets the manifold variety of Savors as the suffering of the Tongue, according to the Asperities of the Salt becomes pleasing or ungrateful. Which is the Opinion of *Fracassarus* in these Words. *Let us conclude,* says he, *that savors owe their effects to the Figures which are only taken from the corporeal Principles, which in mixt things is chiefly the Salt it self, and from the observ'd figures in Salts we collect this, that Salt is the Figurative Principle of Savor.*

Difference of Savors.

XLIX. The *differences of Savors from the various figures of salt Atoms* Gassendus *endeavours thus to demonstrate. By which it comes to pass,* says he, *that he will not incongruously determine the matter, that round Atoms of a just proportion cause a sweet Savor; the great Figure produces sowre; those of many Angles not orbicular, sharp, acute, conic, bow'd, not thin nor round, pricking; thin and orbicular, with corners and bow'd, biting; with corners bow'd unequal in their sides, salt; round smooth, writh'd, equal in their sides bitter; thin, round and small, fat.*

Savor from Salt.

L. *Now that Savor proceeds only from Salt is apparent by Chimistry.* For if *Carduus Benedictus,* which is bitter, be burnt to Ashes, and a Salt extracted out of them, those Ashes will be altogether insipid; but, restore their Salt to them and they will recover their Savor; but not the bitter Savor which the *Carduus* had before it was burnt, because the Sulphury particles were consum'd by the fire, and thence the Asperities of the Salt were alter'd.

Insipidness.

LI. If any one ask me, if Savor be caus'd by Salt, whence comes the insipidness of any thing which is also perceiv'd by the last? I answer'd, that insippidness is not any thing positive which moves the Taste, being nothing else but a privation of the Salt and consequently of the Savor, and it is vulgarly said to be perceiv'd by the Taste, as Silence is said to be heard; or darkness to be seen, when there is no light to peirce the Eye.

Savor is communicated by humidity.

LII. *But the Savor which proceeds from Salt is communicated to the fleshy Teats by the means of Humids.* For whatsoever things are dry, unless they depositе their salt Asperities in something Humid, loose their savor. This Humid is either the Soporiferous Bodies themselves, Wine, Honey, juices of Herbs and Flowers, *&c.* Or Water, Ptisans, Broth, Spittle, or any other Liquor, wherein dry things being bruis'd, dissolv'd, boyl'd or macerated, dissolve and discharge themselves of Savory Salt, which then by means of that Humid may be imprinted into the little fleshy Teats of the Tongue, and perceiv'd by the Taste.

How the Species of Savors are caus'd?

LIII. *When things Tastable are put into the Mouth and mov'd therein upon the Tongue, then their salt Asperities being prest into the humid, through the Pores of the Tongue fall into the little fleshy Teats, and alter after a Specific manner so or so, according to the variety of the figures of the salt particles, and so the several sorts of Savor come to be produc'd, the Idea of which being carry'd to the common Sensory through the little Fibers of the Nerves of the Fourth Pair, inserted into the Tongue, and communicated to the Mind.* Thus if the Particles of the Salt are long, hard, pricking or cutting, and fall into the round Pores of the Tongue, then by reason of the disparity of the Figures of the Pores and the Salt difficultly getting in, they cause a pricking trouble, as in acid, bitter and sharp things. But if the Particles of the Salt are soft, flexible or round, then they easily enter the Pores of the little fleshy Teats, and of the Tongue,

Tongue, and delighting the Tongue cauſe a grateful reliſh; as in Sugar, Honey, *&c.* In the ſame Sence *Lucretius* ſays, that the little Atoms of ſweet things are ſmooth and round: of bitter and acid things, poynted and forked.

What the Agitation ſignifies.

LIV. ***The Agitation or ſtirring of the Mouth is requiſite, to the end the Savor may the better be perceiv'd; though Liquids require a leſs motion, dry things more vehement, and a longer Agitation.*** For in the Liquids the ſavory Salt already diſſolv'd, glides more ſuddainly through the Membrane covering the Tongue into the nervous Teats: But in dry things the ſalt Particles adhering to the thicker ſubſtance, require longer time for this diſſolution and mixture with the Spittle before they can be felt. Beſides that by the ſame ſtirring the Pores of the Membrane of the Tongue are open'd and dilated, by which means the ſaid ſalt Particles now adhering to the Liquor, are forc'd upon them by a kind of violence. For without ſtirring the Mouth the Savor is not ſo perceptible in liquids as in dry things. For if Salt, Sugar, or Aſhes be put upon the Tongue continuing motionleſs, the Taſte will not be ſo quick; but upon ſtirring the Tongue the Taſte is preſently perceiv'd, and the difference proceeding from the diverſity of the figures of the Salt, is judg'd of by the Mind.

Diverſity of the Pores alters the Savor.

LV. Yet the various figure of the Salt alone is not always the Reaſon of the different ſorts of Taſtes, ſeeing that ſometimes the different Conſtitution of the Organ conduces much to it. For the Pores of it in all men, are not always of the ſame Figure; but thoſe which are round in ſome, ſhall be oblong in others, or quadrangular, which will admit the ſmooth round Particles with ſome difficulty, but the long and pointed without any trouble. Which is the reaſon that ſweet things are not grateful to all, nor bitter things nauſeous to others.

Imagination alters the Taſt.

LVI. ***But notwithſtanding all that has been ſaid, we muſt underſtand, that the Imagination contributes very much to the gratefulneſs or diſpleaſing Reliſh of the Taſte.*** In regard that ſome imagin more pleaſure from Taſtes that pleaſe their fancy by pleaſing the Organs of Taſte, others from ſuch things as ſtrike the Organs of Taſte with a kind of ſharpneſs. Thus we ſee many People delighted with the Taſte of Wormwood-wine, Vinegar, ſalted Herrings, though they cauſe ſome trouble in the Organs of Taſte; others abhor ſweet things, not but that they perceive the Taſtes ſuch as they are ſweet or bitter, *&c.* but becauſe a moderate ſharpneſs pleaſes their fancy more than the pleaſantneſs of ſweet things.

Concerning Speech and Voice, to which the Tongue alſo mainly contributes, *See l.* 2. *cap.* 15.

THE

THE FOURTH BOOK OF ANATOMY.

Concering the JOYNTS.

CHAP. I.

Of the HAND.

THE Limbs, by the *Greeks* call'd χῶλα, are Members growing to the Bellys, and distinguish'd with Joynts.

These are twofold, the upermost commonly call'd *Manus* the Hands, in *Greek* χεῖρες, and the lowermost, *Pedes* or the feet, in *Greek* πόδες.

The proportion between the Limbs.

I. Between these Limbs there is requir'd a convenient Proportion in Men well shap'd; that is, that there should be almost the same Proportion from the Share-bone to the extremity of the Heel, as from the Arm-hole to the top of the middle Finger, I say almost, for that for the most part the Thighs are somewhat longer than the Arms. And the length of the Thighs ought to be the length of the Trunk, measuring from the Share-bone to the top of the Forehead. Here *Spigelius* observes, that they who have long Feet, are most commonly loose in their Body, and therefore strong Purgations are never to be given to such Persons.

The Hands.

II. *The hands were given to Man for grasping*, that being a naked and unarm'd Creature, by the assistance of his Reason, he might be able by the help of these Instruments to provide himself not only with one sort of Weapons, Garments and Habitations, but with infinite numbers; and by that means subdue all manner of Beasts, though never so fierce and untam'd. Moreover to the end so divine a Creature might be enabl'd to commit to writing the Laws of God, the Histories and Transactions of worthy Hero's, the Miracles of God and Wonders of Nature, to paint forth the Ornaments of Heaven and Earth, the Delineations of Arts and Sciences, and other Monuments of his Divinity, therefore two Hands were given him that if the one fail'd, the other might be serviceable to him.

III. *Now the Hand is an Organic Part extending from the uper part of the Shoulders to the Extremities of the Fingers.* *The Definition of the Hand.*

IV. It is divided into the Arm and extream Hand. *The Arm.*

The Arm Brachium, *in* Greek βραχίων *is divided into the Arm strictly so taken and the Elbow.* The one reaching from the top of the Shoulder, to the bending of the Elbow; the other from the bending of the Elbow to the Wrist.

V. *The hollow under the Joynt of* *The Armpit.*

of the Shoulder is call'd Axilla, *or* Ala, *the Arm-hole covered with Hair.* Which hair prevents the Skin from gauling through the continual motion of the Arm.

The Axillary Glands. VI. *In this Cavity, under a little Panicle lye conceal'd three conſiderable Kernels, joyn'd to the divarication of the Veſſels, which being clos'd together ſeem to make one.* Theſe the ancient Phyſitians thought to be Emunctories of the Heart.

The Elbow. VII. *The Elbow, in Latin* Cubitus, *or* Ulna, *by* Tully *is call'd* Lacertus, *and by the* Greeks πῆχυ.

The Hands. VIII. *The Hand at the end, being expanded is ſimply called* Manus, *being clutch'd* Pugnus, *and the Joynts of the inner part of the Fingers are call'd* Internodia: *but being ſhut the protuberances of the Joynts are call'd* Conditi.

The Hand is divided into the Wriſt, the ſpace between the Wriſt, and the Fingers.

The Wriſt. IX. *The Wriſts in Latin* Carpus, *in the* Greek καρπὸς, *being next adjoyning to the Elbow, conſiſts of eight Bones diſpos'd in a double Order, which want their proper Names.*

Meta Carpium. X. *The ſpace between the Wriſts, call'd* Meta Carpium *conſiſts of four Bones connex'd with a cloſe and ſtrong Joynt.*

Vola & Palma. XI. *The inner part compoſing the hollow of the Hand, in Latin* Vola Manus *or* Palma, *and the external Part by the* Greeks ὑποθέναρ, *by the* Latins *is call'd* Dorſum Manus, *or the back of the Hand.*

In the hollow of the Hand ſeveral Particulars are to be taken notice of: chiefly the little Mounts, in *Greek* properly call'd θέναρες, and the Lines.

The Mounts. XII. *The little Mounts are the more prominent and fleſhy Parts of the Hand.* The little Mount under the Thumb is call'd the *Mount of Mars.* That next the Fore-finger, the *Mount of Jupiter.* That next the Middle finger, the *Mount of Saturn.* That next the Ring-finger, the *Mount of the Sun*: and that next the Little-finger, the *Mount of the Moon.*

The Lines. XIII. *There are many and various Lines in the hollow of the Hand, not the ſame nor alike in all men.* From whence they that ſtudy Palmiſtry, leaning upon ridiculous and vain Conjecture, are wont to tell the Fortunes of many People, proſperous Matrimony, long Life, numerous Off-ſpring, Riches and the like, milking the Purſes of the credulous and deceiving their Expectations.

By theſe People there are chiefly obſerv'd fourteen Lines; from the Meetings Inter-ſections, crookedneſs or ſtreightneſs, *&c.* of which they gather their Preſages. But three they look upon more conſiderable than all the reſt. The *Line of Life*; the Second running athwart through the middle of the hollow of the Hand, to the *Mount of the Moon*, and call'd the *Liver-line*: and the Third call'd the *Table-line*, or the *Line of Venus.*

The Figures. XIV. *The Fingers*, Digiti *in the* Greek δάκτυλοι, *are five in number upon each Hand, differing in length and thickneſs.*

The firſt which is the thickeſt, and equals all the reſt for ſtrength, is call'd *Pollex*, or the Thumb. The Second is the Fore-finger from the uſe, call'd the *Index*, or *Demonſtrator*, the Pointer, becauſe it is us'd in the demonſtration of things. The Third, or *Middle-finger*, is call'd *Impudicus*, *Famoſus* and *Obſcoenus*, the Obſence and Infamous, becauſe it is uſually held forth at men pointed at for Infamy, and in deriſion. The Fourth, the *Ring-finger*, or *Annularis* and *Medicus*, the Phyſitian's-finger; becauſe that Perſons formerly admitted Doctors of Phyſic were wont to wear a Gold Ring upon that Finger. The Fifth call'd the Little-finger, in Latin *Auricularis*, or the Ear-finger, for that men generally pick their Ears with it.

Every Finger is furniſh'd with three Bones knit together with the *Gynglymus*, to which are joyn'd the *Seſamina.* As to the length of the Fingers, *Raſes* and *Avicen* notably obſerve, that the ſhortneſs of the Fingers denotes the ſmalneſs of the Liver, and conſequently from the length of the Finger, the bigneſs of the Liver. Whether it be true or no, I have not try'd my ſelf, neither have I met with any Anatomiſts that confirm it, however certain it is, that *Avicen* rejects it as an uncertain Obſervation.

The Nails. XV. *At the end of the Fingers on the outſide, grow the Nails, by the Greeks call'd* ὄνυχες; of which the hinder whitiſh part is call'd the *Root of the Nails*;

the white Spots are call'd *Mendacia*, or Lyes, and the hidden Parts under the Nails *Cryptæ*.

The Nails are hard, to defend the tender Extremities of the Fingers, which are endued with a moſt exact Sence of Feeling, and for the Conveniency of Scratching, they are alſo flexible by nature, to the end they may not eaſily be broken; and as to their Shape, they are ſomewhat convex.

They are tranſparent, ſo that according to the Colour of the Fleſh and the Blood underneath, they are either Black and Blew, Red, Pale, Yellow, *&c.* from which Colors, the Phyſitians make many Conjectures of Health, or a bad Conſtitution.

The Skin grows about them on the out-ſide, under lye the Tendons of the Muſcles. For which reaſon, becauſe of the exquiſite Sence of the Place, upon any Bruiſe, the Pain becomes terrible under the Nail.

The whole Arm, together with the Hand, conſiſts of Coverings, Membranes, Bones, Ligaments, Muſcles, Arteries, Veins and Nerves, which are common to all the Parts of the Body.

Such are likewiſe the inner Coverings, Skin, Cuticles and Fat.

The Membranes are Perioſtiums, Membranes of the Muſcles, and Tendons, *&c.*

The Bones are many and various, faſtned together with Ligaments, of which, ſee *Lib.* 9. C. 17. *&c.*

The Arteries proceed from the Axillary Artery, the branchings forth of which are deſcribed, *Lib.* 6. *Chap.* 3.

There are many Veins in the Hand and Arm, which meet however all together at the Axillary Vein, and diſcharge their Blood into it. Of theſe, three are chiefly remarkable by peculiar Names at the Bending of the Elbow, the *Cephalic*, *Baſilic*, and *Median*; which are often opened in letting Blood. Moreover, in the outer part of the Extremity of the Hand, there is one between the Middle and Ring Finger, call'd by a private Name *Salvatella*, the opening of which in melancholy Diſtempers, and Quartan Agues, is very much commended, eſpecially in the Left-hand. But this is only a meer Suppoſition, (grounded upon nothing of Reaſon) of thoſe that being ignorant of the Circulation of the Blood, believe this Vein more eſpecially to diſcharge the Melancholy Blood of the Spleen.

Six Pair of Nerves enter the Arm, the Productions of which, ſee *Lib.* 8. *C.* 3.

CHAP. II.

Of the Foot.

I. *THE Foot, call'd in Latin* Pes, *in Greek* πούς, *is an Organic Part, beginning from the Joynt of the Hip, and extending to the Extremities of the Toes.* *The Foot.*

It is divided into the Thigh, Leg and ſmall Foot.

The Thigh, Femur, μηρός, proceeds from the Joynt of the Hip, to the firſt lower Joynt, which in the Fore-part is call'd the Knee, in the hinder-part the Ham. *The Thigh.*

II. The inner part of the Thigh, is call'd, *Femur*, the outer Protuberance about the upper Joynt, the Hip, the Space to the Buttocks between the two Thighs, the *Perinæum*. *Iſchion.*

III. *At the top, near the Bending, is the* Groin, *where lyes a remarkable Kernel, compoſed of eight leſſer Kernels, which was firmly ſaid to be the Emunctory of the Liver.* Of the uſe of which, ſee *Lib.* 1. *Chap.* 17. *The Groin.*

IV. *The Leg, by the Greeks call'd* κνήμη, *beginning at the Knee, reaches down to the Heel, of which, the fore-part is called* Tibia, *the Shin, and the hinder part* Sura *the Calf*; but the two inferior latter Prominences are called *Malleoli*, or the Ancles. The Phyſiognomiſts obſerve, that they who have large Heels are Envious, they that have flat Heels are Slothful; but I cannot believe there is any Credit to be given to theſe Indications. *The Leg.*

V. *The Foot* Pes, πούς, *which for diſtinction ſake they call the ſmall Foot, is the Foundation upon which the Body ſtands, and is divided into the Foot, the* Metapedium, *and the Toes.* *The Foot.*

The Foot, of which the hinder part is called *Calx*, or the Heel, conſiſts of ſeven Bones, the *Metapedium* of five, the Toes conſiſt of three Bones, except the great Toe, which has but two, to which are alſo added the *Seſamina*.

The upper part of the Foot, which is ruddy, is called the Top of the Foot, and the lower part the Sole of the Foot, which if it be ſo flat as to preſs the Ground without any Hollow-

neſs, denotes the Perſon to be Cunning and Fraudulent.

VI. At the end of the Toes grow Nails of the ſame Subſtance and Nature with thoſe of the Hands.

The whole Leg is compoſed of Membranes, Bones, Ligaments, Muſcles, Arteries, Veins and Nerves, common to all the reſt of the Body.

The Membranes are Perioſteum's, Membranes of the Muſcles, and their Tendons.

The Bones are many and various, faſtned together with Ligaments. Of which, *Lib.* 9.

Of the Muſcles, ſome extend the Thigh, ſome the Leg, others the Foot, and others the Toes. Of which, *Lib.* 5.

The Arteries proceed from the *Crural* Artery, and are diſperſed through all the Parts of the Leg with ſeveral Ramifactions.

In like manner a great number of Veins are diſperſed through all parts of the Leg, following, for the moſt part, in their Aſſent, the Colours of the deſcending Arteries. Of which, more *Lib.* 7.

Four remarkable Nerves alſo for the Faculties of Feeling and Motion, are diſtributed through the whole Leg. Of which, three proceed from the lower Pairs of the Loyns, and the fourth takes its Original from the four upper Pairs of the *Os Sacrum.* Of which more, *Lib.* 8.

THE

THE FIFTH BOOK OF ANATOMY. Concerning the MUSCLES. WITH AN APPENDIX Concerning the MEMBRANES and FIBRES.

CHAP. I.

Of the MUSCLES in General.

A Muſcle is called *Muſculus* in *Latin*, by the Greeks μῦς from μύειν, *to Contract*, or from its Reſemblance; for that ſome Muſcles ſeem to reſemble a ſlead Mouſe ſlender at the Head and Tail, and large in the Middle; by the Latins alſo called *Lacertus*, from its Reſemblance to a *Lizard*.

Definition. I. *A Muſcle is an Organic Part, the Inſtrument of voluntary Motion.*

Compoſition. II. *A Muſcle is compoſed of Diſſimular Parts*, as Fibres, Fleſh, Veins, Nerves, a Tendon, a Covering Membrane, and in fat People, with ſome Fat to moiſten it.

Through the Arteries, the Vital Blood is conveighed for Nouriſhment, and the Reſidue returns through the Veins to its Fountain. Through the Nerves the Animal Spirits flow into it, contributing Feeling and Motion, and doing their Duty in the Act of Nutrition. The fleſhy Subſtance abounds with Fibres for Strength and Bulk, and theſe Fibres are for the moſt part ſtreight. Sometimes where they proceed to their Tendon, ſomewhat bow'd, as in the Muſcles of the Temples, ſometimes Orbicular, as in the Sphincters; ſeldom one Muſcle has two Fibres. It is enfolded

folded with a Membrane to ſtrengthen and cover it, and to ſeparate the Muſcles one from another, and from the adjoyning Parts. It includes theſe Fibres, and in the whole Circuit ſticks to them. *Rolfinch*, *Bauhinus*, and *Stenonis* believes it alſo admits the Productions and Faſtnings to the inner Subſtance of the Muſcle, by which the Fibres are knit together.

Laurentius's Error. III. *Andreas Laurentius* was in an Error, to aſſert that there is a Power of acting in the Muſcles, which only proceeds from the Fibres and Tendony Strings, as is apparent in Perſons languiſhing with Hectic-Fevers and Conſumptions, who ſtill retain their Faculty of Motion, though the Fleſhy Parts are conſumed away.

Muſcles are two-fold. IV. The Muſcles are two-fold, ſome which draw no Parts, as the Orbicular Sphincters of the Fundament and Bladder, which are orbicularly and equally contracted within themſelves, every way like a Ring without any manifeſt Beginning, Middle or End. To which the muſcly Membranes are to be reckoned, which only move the Skin upward and downward, as are the Muſcles of the Forehead and hinder part of the Head, in which there is no manifeſt Diſtinction to be obſerved. Others, which more violently move the Bones and other Parts, may be diſtinguiſhed into Beginning, Middle and End, or elſe, as others will have it, into the Head, Belly and Tail.

The Head. V. ***The Beginning, or Head, is that part of the Muſcle, toward which the Motion is made***; for this is a perpetual Rule, every Muſcle is moved toward its Beginning. This Head is ſometimes fleſhy, often membranous, in others longer, in others ſhorter, ſometimes thicker, ſometimes thinner.

The Inſertion of the Nerve. VI. ***Every Muſcle has a Nerve inſerted into its Head, or elſe about the Middle***; ſometimes one, ſometimes more, as the *Diaphragma*, which has two that are remarkable, and the Muſcle of the *Temples*, which receives three Nerves. Whence *Galen* makes it a certain Rule, where the Nerve is inſerted, there is the Head of the Muſcle. Which Rule, however *Bartholin*, following *Walæus*, ſeems to reject, affirming that ſometimes the Nerve is inſerted into the End of the Muſcle, and that there is no neceſſity that the Nerve ſhould be inſerted rather into the Head than the Tail of the Muſcle; and that it happens only by accident, that the Nerve is inſerted into the Head of the Muſcle, for that the Nerves, while the deſcend, are more eaſily inſerted into the Heads, which are higher, then into the Tails that lye lower. But Experience overthrows the main Prop of this Opinion, by which we find that never any Nerve was inſerted into the Tail of any Muſcle, or if it may ſeem to enter it by chance, 'tis only through the Error of the Anatomiſt, who miſtakes the Head for the Tail. Thus hitherto the middle Membranous Part of the Diaphragma, into which the Nerves are inſerted, has been taken for the Tendon or Tail of that Muſcle, whereas really it is the Beginning of it. The ſecond Argument, Reaſon evinces, which teaches us, that of neceſſity the Nerve ought to enter that Part from which the Swelling of it ought to begin from the Entrance of the Spirits; which when it ought to begin from that part toward which the Motion muſt be made, of neceſſity it muſt be inſerted into the Head. For if the Swelling ſhould begin from the end of the Muſcle, then the Beginning would be drawn toward the Tail. Then Experience or common Sight deſtroys the third Argument, ſeeing that in Nerves which turn back, though they tend upward, nevertheleſs one inſerted into the Heads of the Muſcles of the Larynx, as looking upward.

The Belly of the Muſcle. VII. The Middle or Belly of the Muſcle is the thicker and more fleſhy Part, and is for the moſt part continuous, ſometimes, but rarely ſeparated, with Tendonous Interſections, as in the ſtreight Muſcles of the Abdomen, and the Digaſtricks opening the lower Jaw, and ſome few others, concerning which Interſections, however, ſome are of this Opinion, that another Muſcle begins at each, and that the interſected Muſcles are not one, but ſeveral Muſcles conjoyned together, for the more convenience of uſe.

The Tendon VIII. The End or Tail of the Muſcle, is that which is faſtned to the Part which is to be moved. This is called a *Tendon*, in Latin *Tendo*, becauſe it may be ſtretched, and therefore by ſome called *Chorda*, or a *String*. Which Name of *Tendon*, is by ſome alſo tranſlated to the Membranous Beginnings of ſome Muſcles, as alſo to the Tendonous Separations of the middle Muſcle, ſuch as are in the ſtreight Muſcles of the Abdomen.

IX. *Now*

Its Definition.

IX. *Now a Tendon is a part continuous to a Muſcle, extended through the whole length of the Muſcle.*

Many formerly thought that a Tendon was only the Extremity of the Muſcle, which is faſtned to the other part, whereas indeed the Strings of it are extended through the whole length of the Muſcle. Hence *Lindan* ſays, that a Muſcle is nothing elſe but a *Tendon* cloathed with Fleſh, *and that they are deceived, who think that a Tendon begins beyond the Fleſh; not conſidering that Experience teaches us, that it is extended through the whole length of the Muſcle, and that it is as well in the Beginning as in the Middle.*

Which Extention of the Fibres through the whole Muſcle, *Riolanus* alſo confirms. *The Continuity of the Tendon through the whole Muſcle, to the very End, manifeſtly appears in the Legs of feathered Fowl, and which is a wonder, is many times obſerved to be griſly. And in an accurate Diſſection, you may obſerve the Continuity of the Fibres from the Head of the Muſcle to the End, in a ram or boyl'd Muſcle.*

Whether all Muſcles have Tendons.

X. *'Tis a Doubt, whether all Muſcles have Tendons? Bauhinus* ſays, that the *Tendons* were not ordained barely for Motion, but to cauſe the more violent Motions, and to move the more heavy Members, and to ſtrengthen the Muſcles to prevent their burſting, and therefore the Muſcles do not all end in Tendons. But this is only true in thoſe Muſcles where the Tendon is ſtretched beyond the Fleſh, not in general as to all: For they which never move other Parts, but are contracted into themſelves as the Sphincters of the Fundament and Bladder, do not end in Tendons extended beyond the Fleſh, but have tendonous Strings interlaced between their Fibres; as in the Muſcles of the Forehead, hinder part of the Head, and ſeveral Muſcles of the Face that ſtick cloſe to the Skin. But the Muſcles that move other Parts, extend their Tendons into them beyond the Fleſh, for ſlower Motions thin and leſs diſcernible; for more violent Motions, ſtronger and thicker. Therefore we muſt conclude in oppoſition to *Bauhinus*, that all Muſcles have Tendons, ſome ſtronger and more conſpicuous, extended beyond the Fleſh, others ſlender and not diſcernible, either lying hid under their Fleſh, or interlaced with their Fibres.

This Tendon, according to the weak or ſtrong Motion of the Parts, various in Bigneſs and Form, ſometimes round, ſometimes broad, ſometimes long, ſometimes ſhort, ſometimes ſlender, ſometimes ſtrong, and ſometimes fixed to the Part to be moved with ſeveral Ends.

whether a ſimilar part?

XI. *Bauhinus* with *Aquapendens* aſſerts, that a Tendon is a ſimilar Body, continuous from the beginning to the end of the Muſcle, ſimple, of a Kind by its ſelf, and produced out of the Seed like the other ſeminal Parts. Which is the Opinion of many at this time. But *Veſalius*, *Laurentius*, *Silvius*, and others, with *Galen*, will have it to be a diſſimilar Part, compoſed of a Concourſe of Fibres, Ligaments, and ſlender Nerves, by degrees uniting together into one Body. They will have the Nerve, ſo ſoon as it has entered the Muſcle, to be divided into many ſmall Branches or diminutive Fibres, which are met by a Ligament divided in the ſame manner, and that thoſe little Branches, traverſing to and from, and by that means intermixing with the interlaced Fibres, and united to the end of the Muſcle, conſtitute the *Tendon*, and that the more bulky part proceeds from the Ligament, the leſſer part from the Nerves and Fibres; and becauſe of neceſſity there muſt be ſome empty Spaces between the Fibres, Nature has fill'd them up with Fleſh, to aſſiſt thoſe little Fibrous Branches in Contraction and Relaxation, and to defend them from external Injuries. This latter Opinion *Bartholinus* rejects, but does not ſufficiently refute; only he alledges, that Production of the Nerve, through the middle of the Nerve to the Tendon, could never be diſcovered either by them or any body elſe; which is no Argument there is no ſuch thing. For the Chylifer Pectoral Channel, Lymphatic Veſſels have lain hid for many Ages, which were at length diſcovered, and the ſame may be ſaid as to the Production of the Nerve; for the exact feeling of the *Tendon* ſhews, it cannot be without a Nerve, though not to be diſcern'd; and though a Tendon be not a Nerve, yet it may have Fibres and a Membrane intermixed with it, together with a Ligament.

Hence perhaps it may be concluded, that a Tendon is the moſt neceſſary part of a Muſcle, and extended through the whole Muſcle, but that it is moſt conſpicuous at the end. I anſwer, that though the Tendons of many Muſcles are

are covered with much Fleſh, the reaſon why the Tendonous Subſtance is leſs conſpicuous, it does not follow that it is altogether abſent, for in fat People, the Meſenterium ſometimes is ſo covered with Fat, that no Veſſels can be diſcern'd in it; and thus it happens in the fleſhy Tendons of ſome Muſcles.

The Muſcles vary many ways.

1. In reſpect of their Subſtance, Fleſhy, Membranous, or half Nervous.

2. In reſpect of their Quantity, Thick, Thin, Long, Short, Round, Broad.

3. In reſpect of their Shape, Round, Flat, Delta-like, or reſembling a Monks Hood, *&c.*

4. In reſpect of their Situation; withinſide, oblique, orbicular, tranſverſe; alſo ſome in the Head, ſome in the Trunk, ſome in the Joynts, *&c.*

5. In reſpect of their Original, ſome from the Bones, others from the Griſtles or Tendons.

6. In reſpect of their Inſertion; ſome with one, others with a double, others with a threefold Tendon.

7. In reſpect of their Colour; Red, White, or Livid.

8. In reſpect of their Cloſing together, ſome in one part, ſome with another, or with one or more Muſcles.

9. In reſpect of their Uſe, ſome bending, others ſtretching forth, drawing to, drawing from, lifting up, pulling down, and ſome wheeling.

The uſe. XII. ***The Uſe of the Muſcles is to contribute to voluntary Motion***; Which is performed by theſe Inſtruments alone: for no Part moves with that motion which is not a Muſcle it ſelf or mov'd by a Muſcle. And this motion is call'd Animal or Voluntary being perform'd at the will of the Creature.

Whether the Motion of the Muſcles be voluntary? Here *Picolhomini* and ſome others ſtart a Queſtion, *Whether the motion of the Muſcles can be ſaid to be Voluntary?* Since it is common to Beaſts, which have no Reaſon, and conſequently no Will, and therefore believe *Spontaneous* to be more proper. Nor can it be called *Voluntary*, as being performed in the Womb by the Birth without Will; as alſo when it ſucks before it knows what the Breaſt or Milk is; alſo the Pulmonary Muſcles move the Breaſt when Men are aſleep, and conſequently cannot be ſaid to *Will*. To the firſt I anſwer, that there is a ſort of Will in Brutes, ariſing from ſomething analogous to the Rational Soul, and proceeding from Natural Appetite, and therefore they may be ſaid to have a voluntary Motion. As to the Motion of the Birth, and Breathing of thoſe that are aſleep, I ſay that Animal Motion is not always directed by the Will; but it is ſufficient in Perſons healthy, a ſleep or waking, that it be performed according to the Will. Moreover, the Will is twofold, either by Election or by Inſtinct, as in Men ſleeping, or the Birth in the Womb. *Galen* upon this Subject writes, that of thoſe things which are mov'd by voluntary Motion, ſome are free, others are ſerviceable to the ſeveral Affections of the Body. And that every Creature knows to what Uſes the Faculties of his Soul are ordained, without an Inſtructor. Therefore the Motion of the Muſcles is Voluntary, and not Spontaneous; in regard that Spontaneous Motion, ſuch as that of the Heart, is truly Natural, as not depending upon the Will of the Creature.

Seeing then the Motion of the Muſcle is an Animal Action, and that the Muſcle it ſelf is the Inſtrument of Voluntary Motion; it is a certain Rule, that where-ever there is a Muſcle, there, in the ſame part may be Action, and that what part cannot be moved at pleaſure, that is neither a Muſcle, nor mov'd by a Muſcle, though the Structure of it may ſeem to reſemble that of a Muſcle. Therefore the Heart is no Muſcle, nor moved by a Muſcle. On the contrary, *Stenonis* affirms, that there are ſeveral Muſcles of the Larynx, Tongue and Back, which are never mov'd at the Will of the Mind. Though it is never to be prov'd that there is any of them, but what may be mov'd at pleaſure; and to confirm his Opinion, he maintains the Heart to be a Muſcle.

Whether the Heart be a Muſcle? XIV. *Whatever Part*, ſays he, ***neither requires any Part neceſſary for a Muſcle, nor poſſeſſes any Part deny'd to a Muſcle, yet in Structure is like a Muſcle, cannot but deſerve the Name of a Muſcle, though it be not ſubject to the Power of the Will. But the Heart***, &c. Which way of Arguing, were it allowable, I might argue thus. Whatever Part, neither requires any part neceſſary for the Stomach, nor poſſeſſes any part deny'd the Stomach, yet in Structure and Compoſition, is like the Stomach, cannot but deſerve the Name of the Stomach, though it does

do not concoct the Nouriſhment; but all theſe things requiſite, are found in the Urinary Bladder, Figure, Shape, Subſtance, Arteries, Veins, Nerves, *&c.* therefore the Urinary Bladder deſerves the Name of the Stomach. Then ſays *Stenonis*, *nor poſſeſſes any part deny'd to a Muſcle*; where as 'tis obvious, that there are in the Heart two little Ears, two wide Ventricles, and eleven large Valves, the like to which, were never ſeen in any Muſcle. So that the Heart poſſeſſing many Parts deny'd to a Muſcle, the Structure of it cannot be like to that of a Muſcle. Then the Action of the Heart is to make Blood, which no Muſcle in the whole Body can pretend to do. If he draws his Argument from the Contraction of the Fibers in the Motion of the Pulſe, which is a voluntary Motion, and hence we prove the Heart to be a Muſcle; he may as well prove the Ventricle to be a Muſcle, which offended by corroding things, contracts it ſelf by the Help of the Muſcles, to expel the offending Matter by Vomit or Hickup; or the Gall-bladder, which does the ſame, when offended with boiling Choler; or the Womb contracting it ſelf for the Expulſion of the Birth. Nay, the very Membranes of the Brain, which in Sneezing, contract themſelves, would come to be Muſcles; which being all Abſurdities, prove the Certainty of our Axiom before mentioned.

The Action of the Muſcle.

XV. *There is but one Action of the Muſcle, which is to draw*; which is performed by the Animal Spirits determined into the Muſcle, and flowing into the Fiber, which cauſes the ſwelling Muſcle to contract it ſelf according to its Length. For ſo the Tendon is drawn toward the Head; which Determination, and copious Influx of the Spirits, ſo long as it laſts, ſo long the Muſcle remains contracted.

While this Muſcle is contracted, the oppoſite Muſcle relaxes, becauſe the Spirits, before determined into that, flow into another, which cauſes it to grow languid, ſo that the Swelling and Contraction ceaſes; becauſe the Alteration of the Determination of the Animal Spirits may happen in a moment; though how it is done, we cannot ſo well explain.

Relaxation no Action.

XVI. But this Relaxation of the Muſcle is no Action, but a ceaſing from Action; and therefore they are in an Error, who think it ſo to be. Which *Galen* ſeems to aſſert in one Place, though in another, he ſays, that Contraction is more proper to the Body of the Muſcle then Extenſion; and ſo he ſeems to make Relaxation a kind of ſecundary Action. But if we rightly conſider it, it is no Action, either primary or ſecundary, but only a Motion by Accident.

The Tonic Motion.

XVII. Another Queſtion is, *Whether there be any Action in the Tonic Motion*, when the Muſcles being every way contracted together, the Parts to be mov'd are never bent, but are at reſt; nor do the Muſcles themſelves ſeem to be moved? I anſwer, there is a manifeſt Motion in that caſe; for the Muſcles act every way with equal Striſe, and that which is thought to be the motionleſs reſt of any Part, is cauſed by the Oppoſite Muſcles acting together at the ſame time, and at the ſame time drawing every way the Part to be mov'd.

No difference between Contraction and Tenſion.

XVIII. *Riolanus* ſeems to make ſome Difference between Contraction and Tenſion, and this he calls the Conſervation of the Thing contracted. But in regard this Tenſion is nothing elſe but the Continuation of Contraction, it cannot be ſeparated from Contraction. But, ſays *Riolanus*, many things are extended which are not contracted. As the Yard is extended by a diſtenſive Faculty, but then it is not contracted like a Muſcle. Worms are diſtended, but not contracted; but the Muſcles are both diſtended and contracted. But all this ſignifies nothing to the Muſcles, which by their own ordinary voluntary Motion contract and relax; but by ſome preternatural Cauſe are hindered from that Motion, and many times diſtended, when voluntarily they ought to be relaxed, as in Convulſions, and relax and flax when they ought to be contracted, as in the Palſie.

The Action is performed by Fibres.

XIX. The Action of the Muſcle is performed by its Fibres, Tendons and Nerves. The Fibres cauſe Contraction, by which the Tendon is drawn to, together with the Part which is faſtned to it. Through the Nerves, the Animal Spirits flow in, cauſing Feeling, Swelling and Contraction. But if one of theſe three be wanting, or hindered, the Action cannot be perform'd. For if the Nerve be obſtructed or cut, then the Animal Spirits not flowing into it, there can be no Swelling or Contraction of the Muſcle. If the Fibres are cut athwart, their Contraction is made toward two ſeveral Parts, upward and downward, and ſo the Part to be moved is not brought to. If the Tendon be

be wanting, though the Muſcles ſwell, becauſe it is not faſtned to the Part that is to be moved, it does not draw it. As to the Fleſh that is interlarded among the Fibers that contributes nothing to the Motion, but only ſtrengthens the Fibers, and by its Heat cheriſhes and renders them nimble, and defends them againſt the Injuries of Heat and Cold; but is unfit for the Motion of Contraction, by reaſon of its Softneſs and Looſneſs, which renders it unable to contract it ſelf, or raiſe other Parts. Which *Veſalius*, *Eraſtus* and *Laurentius* not aware of erroneouſly affirming this Fleſh to be the chief Inſtrument of Motion; the Abſurdities of which is apparent, for that the Muſcles of meager Men are ſtronger than the Muſcles of thoſe who are more fleſhy. If any one object that the Muſcles of the Calves of the Legs and Arms draw with more force, by reaſon of their Carnoſity; I anſwer, that their Carnoſity is not the reaſon, but becauſe they are furniſhed with ſtronger, and more numerous Fibers than others.

The difference of Operation.

XX. The Operations of the Muſcles are various, according to the Variety of the Muſcles, to which they are faſtned. In the Breaſt they dilate and contract, in the Gullet they facilitate Swallowing; in the *Larinx*, they cauſe the Modulation of the Voice, *&c.*

Determination of the Spirits.

XXI. But how the Animal Spirits cauſing the Operation of the Muſcle, flow, and are determined in greater quantity at the pleaſure of the Mind, ſometimes into theſe, ſometimes into thoſe Muſcles, is a difficult Queſtion: ſome will have them conveighed through Imaginary *Valves*, which they aſcribe to the Nerves. Others, not ſatisfied with this Fiction, have invented double Tubes, ſo placed from one Muſcle to the other, that in the Contraction of the Muſcle, the Orifice, guarded by a peculiar Valve, opens; and that through that ſame Paſſage, the Spirits flow out of the relaxed Muſcle, into that which is to be contracted, the *Valve* of the other Cloſing at the ſame moment; ſo that they cannot flow forth again, but of neceſſity muſt diſtend the Muſcle, until the Situation of the Parts being again altered, that *Valve* opens, and the other ſhuts, by which means there is a Paſſage opened for the contracting the other Muſcle. This is indeed ingenious, but little to the purpoſe. 1. Becauſe the Muſcles that move the Part to the oppoſite Part, are moſt commonly too far diſtant from the former, ſo that thoſe little Pipes muſt be very long, as in thoſe Muſcles that move the Part forward and backward. 2. Theſe little Pipes, if not every where, yet would be ſome where viſible, ſeeing that the ſmall little Nerves, through which the Spirits flow, are viſible. 3. For that in Wounds, the Muſcles are many times divided one from another, and yet notwithſtanding their Separation, their Motion proceeds in good order every way. Which could not be if there were any ſuch intervening Pipes in thoſe Places cut, and then cicatrized. For by reaſon of their ſmallneſs, they muſt of neceſſity be quite cloſed up by the Scar. 4. The altered Situation of the Parts, cannot cauſe an opening and ſhutting of the Valves. For it is ſuppoſed that the Situation of the Parts alters, as the Spirits flow into this or that Muſcle, and ſo the thing cauſed would precede the Cauſe, and the Influx of the Spirits muſt be before the Cauſe of the Influx.

Des Cartes *his Opinion.*

XXII. *Carteſius* ſeems to favour this Opinion of the little Pipes. *For*, ſays he, *there are little gapings in every one of theſe Muſcles, through which thoſe Spirits may flow out of one into the other, and which are ſo diſpoſed, that when the Spirits come from the Brain toward one of thoſe, they have ſomewhat a greater force than thoſe that go toward the other, and together cloſe up all thoſe Paſſages, through which the Spirits of this may paſs into the other. By which means, all the Spirits before contained in theſe two Muſcles, immediately flow into one of them, and ſo ſwell and contract it, while the other relaxes.*

This ſeems a ſpecious Fiction, and needs no other Refutation than the Story of the little Pipes. Add to this, that when a Body is bended forward and backward, who can imagine ſuch Gapings can be extended from the Muſcles before, to thoſe behind? Shall thoſe Gapings and the Spirits paſs in a ſtreight Line through all the other Parts that lye between? To this *De la Forge* anſwers, that thoſe Spirits do not paſs through all the Parts that lye between, but from the Tendon of the whole Muſcle, through the Pores and inviſible Channels, into the Tendon of the other, for though the Muſcles are remote one from another, the Muſcles lye cloſe together. This ſpecious Fiction pretends that the Spirits flow rapidly from the Tendon of the acting Muſcle, through thoſe ſuppoſed Channels, in the

the Tendon and Belly of the Muſcle which is to act: but what if the oppoſite Muſcle ſhould not act but lye ſtill, wherefore then, the action of the acting Muſcle ceaſing, do not thoſe ſpirits flow into the oppoſite that reſts, when the Paſſages are open, and the Muſcle is capable to receive them. If it be impoſſible they ſhould be ſo ſoon diſſipated through the Pores of the Muſcle, or return into the Veins or Arteries, where do they then remain? Since they do not enter any other from the acting Muſcle ſurceaſing its action ſo ſuddainly? Or if they cannot enter the Muſcle that is to act by reaſon of the length of the diſtance; What hinders their entrance into the next adjoyning Muſcles or Tendon? This the *Valves* occaſion adjoyning to the Channels, ſays *de la Forge*. But wherefore are they not ſufficiently open when the violent ruſhing of the Spirits into the acting Muſcle and it's Tendon is ſufficient to open the *Valves* of the Channels, tending toward the other oppoſite, and ſo to make a free paſſage for its ſelf from that into this: Beſides that all *Valves* give paſſage to one Part, but ſtill prevent the flowing back. So that thoſe *Valves* that open to tranſmit the Spirits from the right acting Muſcle to the left, which never permit the ſame ſpirits to paſs back from the left to the right. Beſides, if thoſe ſpirits enter the Muſcle, which is to act through the Tendon, then the Tayl of the Muſcle will ſwell ſooner then the Head, and ſo the Tayl ſhall be drawn toward the Head, and not the Head toward the Tayl. Then if the Muſcles that are to act, could not ſwell ſo ſoon as they ought, unleſs they borrow'd ſpirits from the neighbouring Muſcles ceaſing to act, nor fall again, unleſs they diſcharg'd their ſpirits into the adjoyning Muſcles, what ſhall we think of the Sphincters that riſe and fall, act and ſurceaſe to act, yet neither receive any ſpirits, nor diſcharge any into any oppoſite Muſcles, as having no ſuch. Or elſe as if the ſpirits were endu'd with reaſon, and knew when to open or when to ſhut the *Valves*, or when to paſs through and when not: Certainly ſuch Philoſophers ſeek rather to wreſt Nature to their conceits, then to direct their conceits according to the Laws of Nature. See more of this *l.* 8. *c.* 1.

CHAP. II.

Of the Muſcles of the Head.

THE Muſcles of the Head, either move the whole Head, or ſome parts belonging to the Head.

The whole Head is mov'd either *Secundarily*, as it follows the Muſcles of the Neck, caus'd by the Muſcles of the Neck; or *Primarily*, as it is turn'd by its proper Muſcles above the Firſt *Verteber*, upon which it is immediately placed, either forward, backward or ſideways: alſo as it is turn'd above the Tooth-reſembling Proceſs of the Second *Verteber*, as upon an *Axle*.

The Firſt Motion is perform'd by Nine pair of Muſcles.

I. *The Firſt Pair, call'd* Splenium, *oblong, thick, fleſhy and ſpread over both* Vertebers. *It riſes from a Nervous beginning, partly from the Spines of the five upper Vertebers of the Breaſt; partly from the lower Spines of the Vertebers of the Neck, and aſcending upwards inſerted with a broad end into the hinder part of the Head; and draws the head directly to the hinder Parts: or if one only act, it draws the head backward toward the ſide.* *The Spleny Muſcles.*

II. *The Second Pair, call'd the* Complex *Pair*, becauſe every Muſcle ſeems to conſiſt of three Muſcles, as having various beginnings and many Tendonous and Fleſhy parts. This Pair ariſes at the ſeventh *Verteber* of the Neck, and the firſt, ſecond, third, fourth, and fifth Vertebers of the Breaſt, and is moſt firmly faſten'd to the hinder part of the Head, ſometimes with a ſingle, ſometimes with a treble Tendon. Whence *Galen* affirms theſe Muſcles to be three-fold. Nevertheleſs that they are ſingle is apparent, becauſe there is no ſeparation of any Membrane, but are included within their own Membrane only, which could not be, if they were divided into many Muſcles. For then they would have every one their proper Membrane, by means whereof it might be ſeparted from the other. *The complex Pair.*

The ſmall and thick Pair.

III. *The Third Pair call'd the ſmall and thick Pair,* ſeated under the Second Pair, riſes with a Nervous beginning from the tranſverſe Proceſſes of the firſt Vertebers of the Neck, rarely from the Five Pairs of the upper Vertebers of of the Breaſt, and growing fleſhy, extends it ſelf obliquely upward and inward, and is inſerted with a Nervous end into the hindermoſt root of the Mamillary Proceſs, and lighty draws the head backward; but if one only act, it bends it backward toward the ſide.

Riolanus believes this Pair to be nothing elſe, but a production of the Spinatic Muſcle, reaching to the head near the Mamillary Proceſs.

The bigger ſtreight Pair.

IV. *The fourth Pair, call'd the bigger, ſtreight Pair*, is ſmall, fleſhy and ſlender, and riſes from the top of the Spine of the Second Verteber of the Neck, and ending in the middle of the hinder part of the Head, aſſiſts the motion of the Third Pair.

The leſſer ſtreight Pair.

V. *The Fifth Pair, call'd the leſſer ſtreight Pair,* lyes under the former, and reſembles it in ſubſtance, ſhape and courſe. It riſes from the hinder part of the firſt *Verteber*, and being inſerted into the hinder part of the Head, aſſiſts the motion of the Third and the preceding Muſcle.

The upper oblique Pair.

VI. *The ſixth Pair, call'd the Upper Oblique Pair,* is ſeated under the right Pairs, and reſembles them in ſubſtance and ſhape. It is ſmall and riſes from the Proceſs of the firſt Verteber of the Neck, and ends in the hinder part of the Head, near the outward ſide of the right Pair. *Bauhinus* ſays it riſes in the hinder part of the Head, and ends at the lateral Proceſſes of the firſt Verteber of the Neck. This acting we nod ſlightly ſtreight forward: if either act, it inclines the Head backward to one ſide.

The lower oblique Pair.

VII. *The Seventh is the Lower Oblique Pair,* oblong, fleſhy and round, riſing from the Spine of the Second *Verteber* of the Neck, and inſerted into the tranſverſe Proceſs of the firſt Verteber, and turns it round with the Head annex'd to it, to the ſides.

The Maſtoides Pair.

VIII. *The eighth, call'd* Maſtoides, ſeated in the fore-part of the Neck, ſtrong, long and round, which by reaſon of its two beginings, ſome aſſert to be two-fold. It riſes Nervous and broad from the upper part of the Sternon and *Clavicle*, and with a fleſhy Tayl is inſerted into the Mamillary Proceſs and the hinder part of the Head; this Pair bends the Head forward and downward, and if one act at a time turns it obliquely to the ſide.

The inner ſtreight Pair.

IX. The Ninth Pair, diſcover'd by *Falloppius*, which may be call'd the *Inner Streight* Pair, ſeated under the Gullet in the fore-part of the Neck, joyns to the Firſt Pair of the Neck. It riſes with a Nervous beginning from the Ligaments of almoſt all the Vertebers of the Neck, and with a Fleſhy tayl is inſerted into the Baſis of the Head, between both Proceſſes, where it is joynted with the firſt *Verteber*, and bends the Head forward, when we nod.

The movers of the Parts in the Head.

X. *The Muſcles which move the Parts contain'd in the Head are many and various:* two in the Forehead four belonging to the Eye-lids; twelve to the Eyes; eight to the Ears; four to the Membranes of the *Tympanum*; eight to the Noſe; fifteen to the Cheeks and Lips; ten to the lower Jaw; ten to the Tongue; eight to the *Hyoides* bone; the form, beginning, inſertion, ſituation and uſe of all which we have deſcrib'd, *l.* 3.

So that the Muſcles of the Head in all are Ninety and Nine.

CHAP. III.

Of the Muſcles of the Neck.

THE Muſcles which primarily move the Neck, and ſecondarily the Head, are four on each ſide, which move the Neck forward, backward and ſideways.

The long Muſcles.

I. *Two Long, which lye hid under the Gullet.* Theſe riſe fleſhy from the fifth and ſixth Verteber of the Breaſt, and aſcending upward, with a ſharp Tendon are inſerted together into the extuberant Proceſſes of the firſt Verteber of the Neck: ſometimes they are faſten'd to the hinder part of the Head near the Great hole. By the benefit of theſe Muſcles, the Neck together with the Head is bent directly toward the the fore Parts; but ſideways, by the ſingle motion of one.

II. *Two*

The Scalen Muscle. II. Two *Scalen's*, (these some reckon among the Muscles of the Breast) which are more properly seated in the Sides, and proceeding from the first Rib with a fleshy Beginning, are inserted within side into all the transverse Processes of the Vertebers of the Neck, the first and second sometimes excepted, and assist the Motion of those already mentioned. These Muscles have a peculiar Hole, through which the Arteries descending to the Arm, and the Veins ascending thence, find their Passage.

The Transversal Muscle. III. *Two Transversals, seated in the Back*; These arising from the Roots of the Processes of the six superior Vertebers, and insensibly becoming more fleshy, are fastned to all the Transverse Processes of the Vertebers of the Neck without-side, and bend the Neck to the hinder Parts, or by the single Motion of one, obliquely backward. Between these Muscles the Nerves of the Spinal Pith are carried, arising from the Vertebers of the Neck.

The Spinati Muscles. IV. *Two called* Spinati, which being long and broad, possesses the whole Neck between the Spines. They arise from seven Spines of the Breast, and five of the Vertebers of the Neck, lying one upon another, and distinguished only by the Spines, and are implanted into the whole inferior Seat of the second Spine of the Verteber of the Neck, and together with the Transversals move the Neck obliquely toward the hinder Parts.

The number of the Muscles of the Neck. To these eight Muscles of the Neck, if you reckon the thirteen Muscles of the Larynx, seven of the Gullet, the eight of the Hyoides-bone, and ten of the Tongue, which are all seated in the Neck, the Muscles of the Neck will amount to forty six.

CHAP. IV.

Of the Muscles of the Arms or Shoulders.

THE upper Part of the Arm, reaching from the Top of the Shoulder to the Elbow, which they call the Shoulder, is moved by various Motions; five in the first place, forward, backward, upward, downward and circular. Which Motions are performed by nine Muscles.

The Pectoral Muscle. I. *The first, by reason of its Situation, is called the Pectoral*; which being of a fleshy Substance, and incumbent upon the Breast, which arises with a membranous Beginning from the middle Clavicle, and the whole *Sternon Bone*, as also from the Muscles of the Sixth, Seventh and Eighth Rib; as if it were composed of several Muscles, and being streightned toward the End, is implanted with a streight and narrow Tendon into the Bone of the Shoulder, a little below the Head of it, and brings the Arm forward before the Breast, and that either in a streight Line, or somewhat upward or downward, as sometimes all, sometimes the middlemost or uppermost, or lowermost Fibers are contracted. This may be manifestly divided into two Muscles, but not into three or four, as *Bauhinus* was of Opinion.

The triangular humeral Muscle. II. *The Second, from the Figure of the Greek* Delta, *is called* Deltoides, *and the Triangular Humeral.* This proceeds with a broad and nervous Beginning from the middle Part of the Clavicle, to the Top of the Shoulder, and the whole Spine of the Scapula, and with a strong Tendon, fleshy without, nervous within, is extended to the middle of the Shoulder-bone, and raises the Arm upward, sometimes before, sometimes backward, according to the various Contraction of the foremost, hindermost, middlemost, or all the Fibres. In the middle Part of this, Unskilful Chyrurgeons make little Issues; but very erroneously; for that upon Contraction of the Muscle, the Hole of the Fontanel must be contracted, by which means, the Pea or Pellet is forced out with Violence and Pain, and the Fontanel suddenly closes up again. Which Mistake is easily avoided, by making the Issue between this and the *Biceps* Muscle, four or five Fingers Breadth below the Joynt of the Shoulder; in which Place, while the Arm is bent, this Space between the two Muscles is presently perceived.

The Aniscalptor Muscle. III. *The Third, from the Use of it*, Aniscalptor, *or* Buttock-Scratcher, because it draws the Arm downward behind; but by reason of its Largeness, it is called *Latissimus*, or the Broadest; because, that together with its fellow Muscle, it covers the whole Back. It arises with a membranous and broad Original from the Tops of

the Vertebers of the Spine, which are ſeated between the *Os Sacrum* and the ſixth Vertebet of the Breaſt; as alſo from the upper part of the *Hion-Bone*; from thence, being become fleſhy, it approaches the Baſis of the *Scapula*, from whence ſometimes it receives ſeveral fleſhy Fibers, and at length, with a ſhort, but ſtrong and broad Tendon, it is inſerted between the Pectoral and the Round Muſcle, and draws the Arm downward behind; ſometimes more to the upper, ſometimes more toward the lower Parts, according as theſe or thoſe Fibres are contracted, of which it has many, by reaſon of its large Beginning.

The bigger round Muſcle. IV. *The Fourth, called the bigger Round Muſcle,* which being fleſhy, is ſeated behind under the Arm-pit, ariſes with a fleſhy Beginning from the whole lower Rib of the *Scapula*, and with a ſhort, broad and ſtrong Tendon, ends in the Bone of the Arm, a little below the Neck, and draws the Arm downward behind.

The leſſer round Muſcle. V. *The Fifth, from its Situation, called the* Shorter Tranſverſal Muſcle, *from its Form, the* Leſſer Round Muſcle, riſes from the lower Corner of the *Scapula*, and being extended to the Neck of the Arm, aſſiſts the Motion of the fourth Muſcle, of which, ſome think it to be a Portion.

The Infra Spinatus. VI. *The Sixth, is called* Supra Scapularis Inferior, *by others,* Infra Spinatus, becauſe it covers the whole Exterior Part of the *Scapula*, that lies under the Spine. This ariſing from the Baſis of the *Scapula*, below the Spine, is inſerted with a ſhort and broad Tendon into the Ligament of the Shoulder, which faſtens the Joynt, as into a Semicircle, and winds the Arm to the hinder Parts.

The Supra Spinatus. VII. *The Seventh, is called* Super Scapularis, *Superior, by others,* Supra Spinatus. It ariſes from the Baſis of the *Scapula*, and filling the whole Cavity between the Spine and the upper Rib of the *Scapula*, is inſerted obliquely into the Neck with a broad and ſtrong Tendon that paſſes beyond the Joynt, and together with the former, cauſes the circular Motion of the Arm; though others believe, that together with the *Deltoides*, it moves the Arm upward.

The Subſcapular Muſcle. VIII. *The Eighth, which is called the Subſcapulary or the Immers'd,* is very fleſhy, and being ſeated between the *Scapula* and the Ribs, poſſeſſes the inner Part of the *Scapula*, and is inſerted with a broad Tendon withinſide into the Second Ligament of the Shoulder, and brings about the Arm toward the inner Parts.

The *Tendons* of theſe three Muſcles, ſixth, ſeventh, and eighth, that bring about the Arm, as it were orbicularly enfold the whole Ligament of the Joynt. Nevertheleſs we are to underſtand, that this ſame circumacting Motion is very much aſſiſted by the reſt of the Muſcles, acting ſucceſſively.

The Perforate Muſcle. IX. *The Ninth, is called* Perforatus Coracoides, *and* Coracobrachiæus, which riſes with a ſhort and nervous beginning from the Proceſs of the *Scapula*, and with a ſtrong Tendon runs almoſt to the middle of the Arm before, and together with the Pectoral, brings it forward toward the Breaſt. The Belly of this is boar'd through, and affords a Paſſage to the Nerves, which are diſtributed to the Muſcles of the Elbow. *Riolanus* believes this Muſcle to be a Portion of the *Biceps*, or firſt Muſcle of the Elbow.

CHAP. V.

Of the Muſcles of the Scapula.

THE *Scapula*, (which is joynted with the Bone of the Shoulder, by means of a moſt thick Ligament, and a large Nerve) beſides that, it is moved by accident by the foreſaid Muſcles of the Shoulder, has alſo four peculiar Motions, which are performed by the benefit of the four following Muſcles.

The Serratus minor. I. The *Leſſer Serratus*, which lying under the Pectoral Muſcle, ariſes, as it were, like ſo many Fingers, from the four uppermoſt Ribs, the firſt excepted, and is inſerted into the *Scapula*, at the Corocoides Proceſs, and brings forward toward the Breaſt.

The Trapezius. II. *The* Trapezius, *or* Cucullaris, becauſe that together with its Pair covering the Back, it has ſome kind of Reſemblance to a Monks Hood. It takes its beginning from the hinder part of the Head, and the Top of the five Spines of the Neck, and the upper eight or nine of the Breaſt; thence growing more narrow, it proceeds toward the

Scapu-

Scapula, is inſerted into the whole Spine of it, the Top of the Shoulder, and the broader Part of the Clavicle, and moves the *Scapula*, by reaſon of its various Original, and ſeveral Fibres, upward, downward, right forward, oblique, according to the Contraction of theſe or thoſe Fibres.

The Rhomboides. III. *The* Rhomboides, which is thin, broad and quadrangular, lying hid under the Skin, and ariſes with a fleſhy Original, from the Spines of the three lower Vertebers of the Neck, and the three uppermoſt of the Breaſt, and is inſerted into the External Baſis of the *Scapula*, and draws it ſomewhat upward toward the hinder Parts, and brings it to the Back.

The bigger and round Muſcle. IV. The *Levator*, which proceeding from the tranſverſe Proceſſes of the ſecond, third and fourth *Verteber* of the Neck (the diverſe Heads uniting about the Middle) is by a broad and fleſhy Tendon inſerted into the upper and lower Angle of the *Scapula*, and draws it up forwards, and raiſes it with the Shoulder.

The Levator. To theſe Muſcles of the Shoulders, ſome there are who add the larger *Serratus* and the *Deltoides*; but erroneouſly, when the one belongs properly to the Breaſt, and the other is a Muſcle of the Shoulder.

CHAP. VI.

Of the Muſcles aſſiſting Reſpiration.

SEeing that the Blood which rarified in the right Ventricle of the Heart, ought to be refrigerated and condenſed, before it comes to the left Ventricle, there is a neceſſity for Reſpiration, that by the Alternate Dilatation and Contraction of the Breaſt, the cold Air may be received into the Lungs, and again expell'd from thence, together with the Vapors; and there is ſo great a neceſſity of this, that without it, it is impoſſible for Man, after he is born to live, but that he muſt dye upon the Suffocation of the Heat.

Now this Motion of Reſpiration, not being a Natural, but an Animal Motion, it muſt be performed by Inſtruments that ſerve the Animal Motion, that is to ſay, the Muſcles, of which, though the Lungs are deſtitute, yet to the end, this Motion may continually go forward, the Supream Creator has added to the Breaſt ſeven and fifty Muſcles for the Service of Reſpiration, to dilate and contract it by continual Alternation, and after the ſame manner, by accident to move the Lungs.

The Diaphragma. I. *The broadeſt and biggeſt of theſe Muſcles, which more inwardly ſeparates the Breaſt from the lower Belly, is called the* Diaphragma.

The reſt are interwoven with the Ribs, or elſe are ſpread upon them.

The Intercoſtal Muſcles. II. *Thoſe that are interwoven with the Ribs, are the* Intercoſtals, forty four in all, on each ſide twenty two, eleven external, and as many internal; all ſhort and fleſhy, ſprinkled with oblique Fibres, carried from one Rib to that which is next, and mutually cutting each other like the Greek Letter χ. Of which, theſe ariſe from the lower Parts of the upper Ribs; and deſcending obliquely toward the hinder Parts, are inſerted into the lower Parts of the upper Ribs; the other are carried a contrary Courſe, theſe end in the Griſtles, the other fill the Spaces of the Ribs and Griſtles.

Here *Nicholas Stenonis* well obſerves, that there are ſome Muſcles beſides the *Intercoſtals*, which are vulgarly numbred among the *Intercoſtals*, whereas they are Muſcles quite different from them; that is to ſay, Thoſe which from the tranſverſe Proceſſes of the Vertebers terminate in the upper ſide of the lower Ribs, and properly to be called the *Lifters of the Ribs*. Moreover, he adds this Caution, that neither that ſame Part of the exterior *Intercoſtals* is to be paſs'd ſlightly over, which faſtens the bony Extremity of the upper Rib, with the Griſtle of the lower.

The Veſſels of the Intercoſtals. III. The *Intercoſtals* receive Arteries from each *Intercoſtal* Artery, and ſend forth Veins to the *Azygon*, and upper *Intercoſtal*. They receive Nerves from the ſixth Pair, to which are joyned thoſe which proceed from the Pith of the Back.

The Action of the Intercoſtals. IV. As to the Action of the *Intercoſtals*, Anatomiſts are in diſpute about it.

John Mayo, an Engliſh Man, aſcribes to theſe Muſcles, the Office of dilating the Ribs in Reſpiration, or of removing them one from another, and adds alſo, that the *Diaphragma* dilates the Breaſt. But the firſt is impoſſible, ſeeing

ſeeing that the Office of the Muſcles, is by contracting themſelves to draw with them the Parts faſtned to them, and ſo the *Intercoſtals* would draw the Ribs which are faſtned to them, and ſtreighten the Breaſt. The latter, concerning the Diaphragma, we have refuted already. Some believe that the Internal dilate, and the External contract the Breaſt; others aſſert quite the contrary, both erroneouſly, for the reaſon laſt alledged. Others believe they act nothing in Reſpiration; but that in Expiration they contract the Ribs together, and help the Motion of the Diaphragma; which is our Opinion alſo, becauſe their Actions cannot be different, but that they muſt conſpire to one end, which is to draw the Ribs to themſelves, and contract the Breaſt.

By reaſon of the ſmallneſs and thinneſs of theſe Muſcles, *Falloppius* was of Opinion, that they were not Muſcles, but only fleſhy Ligaments of the Ribs. Which were it true, the Ribs had not wanted Fibres croſs-wiſe cutting one another, as we obſerve in theſe Muſcles.

The Reſpiratory Muſcles which are ſpread upon the Ribs, are ſix of each ſide.

The Subclavius. I. *The Subclavial*, ſeated under the Clavicle, ariſes fleſhy from the inner Clavicle near the *Acromium*, and carried forward with oblique Fibers, for the moſt part tranſverſe, is inſerted into the firſt Rib near the *Sternon*, and by drawing it upward and outward, dilates the Breaſt.

The Serratus Major. II. *The bigger Serratus*, ſeated in the ſide of the Breaſt, and remarkable for its ſingular broadneſs and Carnoſity, reaches from the inner Baſis of the *Scapula* to ſix or ſeven Ribs, and with five unequal Extremities, is inſerted into five true, and two or three ſpurious Ribs, before they terminate in the Griſtles; though *Riolanus* will have it ariſe from the two upper Ribs, and extend it ſelf to the Clavicle. However *Spigelius* and *Veſlingius*, aſcribe an Original and Uſe quite contrary, but erroneouſly. The Motion of this Muſcle is much aſſiſted by the oblique deſcending Muſcle of the *Abdomen*, and the Motion of this by that. And hence it is that the Extremities of the one are interpoſed into the Extremities of the other, Finger-wiſe, and ſo they both together form a ſerrate Joynture, like the *lower Serratus Poſticus*.

The upper Serratus Poſticus. III. *The upper Serratus Poſticus*, which being ſmall, is ſeated in the Back under the Rhomboides, between both *Scapulas*, and above the firſt Pair of the Muſcles of the Head, and riſes with a membrany Subſtance from the Spines of the three inferior Vertebres of the Neck, and of the firſt of the Breaſt, and is inſerted into the Intervals of the three or four uppermoſt Ribs, and by lifting them upward dilates the Breaſt.

IV. *The lower ſerratus Poſticus*, broad and Membranous, ſeated almoſt in the middle of the Back, under the third broadeſt Muſcle of the Back, or the Aniſcalpter, proceeds from the *Spines* of the three inferior Muſcles of the Back; and of the firſt of the Loins; and terminates in the three or four lower ſpurious Ribs, by drawing which outward, it dilates the lower part of the Breaſt. *The lower* Serratus poſticus.

V. *The Sacrolumbus*, ſpread under the preceeding, which ariſing from the Brim of the *Ilion* Bone, the hinder part of the *Os Sacrum*, and the Spiny *Apophyſis* of the Loins, aſcends with a fleſhy portion even to the Ribs, into all and every one of which it is inſerted in the lower part; and about three fingers diſtance from the Spines, in the place where the Ribs begin to bow faſtens to a Tendon, concerning which Tendon Anatomiſts have been much miſtaken, ſome with *Laurentius*, were of opinion that this Muſcle ſent forth a double Tendon, one upward to the inferior part of the Ribs; another downward toward their upper part, and that ſo by the means of theſe various Tendons, (which are manifeſt by ſeven about the Ribs) the Ribs were lifted up in fetching breath, and drawn downward in expiration. But in regard ſuch contrary Actions cannot be performed by one and the ſame motion, I thought it probable that the deſcending Tendons proceed from ſome other peculiar Muſcle, and therefore upon diligent ſearch I found, that they proceeded from a certain Muſcle, that lyes ſpread under the *Sacrolumbus*, and ſticks ſo cloſe to it, that it can hardly be parted. This I perceived ow'd its Original to the three, four, five, ſix, ſeaven Vertebers of the Neck (and therefore I call'd it the deſcending *Cervical*) and that it roſe from them with a fleſhy ſubſtance and ſent forth Tendons downward to the upper part of all the Ribs, directly oppoſite to the Tendons of the *Sacrolumbus*, and that the Tendons of theſe two Muſcles mutual intercut one another croſe-wiſe, and that they did not act together but alternately. *The* Sacrolumbus.

For

For that the Tendons of the deſcending *Cervical* draw the Ribs upward in fetching breath, ſo that they may not be remov'd or dilated in the middle ſpaces one by another; but the Tendons of the *Sacrolumbus* in expiration draw the Ribs downward; ſo that they may not be contracted to themſelves. As to the inſertion of the Tendons of the *Sacrolumbus*, *Nicholas Stenonis* makes this Obſervation. *The Fibres* ſaith he, *are not preſently carry'd from the lower Rib to the next inferior, but ſome paſs over three, others more that lye in the middle; neither are thoſe which one Fibre ſends forth inſerted into one Fibre only, but ſome provide for three, others five, others ſeven Ribs. By the ſame reaſon, every conſpicuous Tendon, not contented with that fleſh which one Rib affords, in ſome places muſter Fibres together from four or five Ribs together. Neither are theſe things ſo confus'd, but that in a Carkaſs of any reaſonable bigneſs they may be eaſily demonſtrated and ſhown; as well by ſtreight diſſection from a Tendon deſcending backward; as in a tranſverſe diſſection, proceeding upward from the intercepted ſpace between the Ribs; to the end the Number of the Tendons of one Belly may be ſeen. In regard that every entire Belly affords its part to each: ſo that every entire Tendon proceeding from ſeveral Bellys, receives its Portion from every one in particular.*

The Triangular.

VI. *The Triangular*, vulgarly ſo call'd, though it does not form a true Triangle. This being very ſmall and ſlender proceeds from the middle Line of the *Sternon*, and ſends forth on each ſide four ſmall Projections to the Bony Extremities, of the three, four, five and ſix true Ribs, (where they are joyn'd to the Griſles) by lifting up which Ribs they ſtreighten the Breaſt, and depreſs the fore-part of it.

To theſe ſix Muſcles *Fallopius* adds three others ſeated in the Neck, which *Veſalius* with more reaſon judges to be part of the Muſcles of the Neck and Back.

Theſe Reſpiratory Muſcles are ſecundarily aſſiſted in their duty by the Muſcles of the *Abdomen*, *Scapula's*, and Arms.

CHAP. VII.

Of the Muſcles of the Back and Loyns.

BY reaſon of the various motions of the Back, and eſpecially of the Loyns, forwards, backward and ſideways, Tendons of Muſcles are inſerted into every one of the *Vertebers*; as if there were many Muſcles there; which nevertheleſs ſome Anatomiſts refer to one great Muſcle, from which they hold all thoſe Tendons are produc'd. Which Opinion ſeems to have been grounded upon this, that the Muſcles of the Back and Loyns in many places ſtick ſo cloſe one to another, that they can hardly be ſeparated, but an exact and curious Diſſection will ſhew four Pairs of Muſcles, in the Back and Loyns, by means of which the violent motions of thoſe Parts are perform'd, eſpecially about the laſt Verteber of the Breaſt, and firſt of the Loyns, as being thoſe which ſtick leſs cloſe together then the reſt.

The Quadrati Muſcles.

I. *The firſt Pair conſiſts of two Triangular Muſcles, which being joyn'd together make a kind of a ſquare, vulgarly call'd* Par Quadratum. Theſe being broad and thick internally proceed from the hindermoſt upper Cavity of the *Ilion* Bone, and the lateral part of the *Os Sacrum*; and are inſerted into the tranſverſe Extuberances of the lumbal Vertebers, as far as the laſt Ribs, being of a fleſhy ſubſtance, and bend the Vertebers of the Loyns foward, or one or other acting obliquely forward toward the ſides.

The longeſt Muſcles.

II. *The Second and Primary Pair, conſiſt of the* Longeſt Muſcles, which are extended from the Extremity of the *Os Sacrum* and *Illium* to the Mamillary Proceſſes, near the Temple bones; and afford Tendons to the ſeveral Proceſſes of the lumbal Vertebers and Back; and for the moſt part are confus'd with the *Sacrolumbus*, *and ſemi-Spinatus* as far as the lowermoſt Verteber of the Back; being ſeparated from it toward the upper Parts which is the reaſon that many miſtake theſe three for one Muſcle, in regard it is ſo hard a matter to ſeparate them. Some have divided this Pair, into as many Pairs as there

are

are Muſcles; but *Galen* rightly deſcribes it for one Pair affording Tendons to all the Muſcles.

The Sacred Muſcles. III. *The Third Pair of the* Sacred *Muſcles*, which riſe with a ſharp and fleſhy beginning from the hinder part of the *Os Sacrum*, and terminate with ſeveral Tendons in the Spine of the twelfth Verteber of the Breaſt, and for the moſt part in the Spines and oblique Proceſſes of the lumbal Vertebers alſo, and aſſiſt the action of the former.

The Semi-Spinati. IV. *The Fourth Pair is compos'd of the Semi Spinati*, which riſing with a Nervous beginning from all the Spines of the *Os Sacrum* and Loins, in the Proceſſes of the Loins, and lower tranſverſe ones of the Breaſt; and lift up the Breaſt.

All theſe Muſcles acting together the Spine is lifted up, and ſo upheld or bow'd. But when thoſe that are in either ſide act alone, it is writh'd to the ſides.

But the Muſcles of the Abdomen, eſpecially the ſtreight ones, mainly aſſiſt the bowing of the Loins and the whole Spine toward the fore-parts. For while they are contracted they depreſs the Abdomen and Breaſt, and withal bow the Spine, which he who lying upon his back, and would raiſe himſelf without the help of his hands, ſhall manifeſtly perceive.

CHAP. VIII.

Of the Muſcles of the Abdomen and the Parts contain'd in the lower Belly.

The Muſcles of the Abdomen. I. THE *Abdomen is furniſh'd with ten Muſcles*, for ſqueezing down the Nouriſhment and violent expulſion of the Excrements and Birth. Two obliquely aſcending, and as many obliquely deſcending; two ſtreight, and as many Pyramidical, theſe adhereing together in the lower Part; and two tranſverſe. The Podex has three Muſcles one Sphincter and two Lifters up. *l.* 1. *cap.* 8.

The Bladder is purs'd together with one Sphincter. *l.* 1. *cap.* 21.

The Teſticles of Men hang by two Muſcles call'd *Free-maſters*. *l.* 1. *cap.* 22.

The Yard has four Muſcles. *l.* 1. *cap.* 23.

The Clitoris in Women is furniſh'd with four Muſcles. *l.* 1. *cap.* 25.

CHAP. IX.

Of the Muſcles of the Elbow.

THE Elbow conſiſts of two Bones, which as they are knit together with various Articulations, ſo have they their Motions ſomewhat various. The Bone of the Elbow directs bending and extention. The *Radius* turns the Palm and back of the Hand either upward or downward; and therefore they have their proper Muſcles to direct their different Motions.

The Muſcles of the Elbow. I. *The Bone of the Elbow is mov'd with four Muſcles*, two bending, ſeated in the fore-part of the Arm, and two extending, which poſſeſſes the hinder part of the Arm. The firſt are call'd *Biceps* and *Brachiæus*, the latter *Long* and *Short*.

The Biceps. II. *That call'd Biceps*, riſes with a double and ſtrong beginning, the one Nervous, from the *Acetabula* of the *Scapula* it ſelf. The other partly Fleſhy, partly Nervous, from the Coracoides Excreſcence of the *Scapula*. Which Beginnings being afterwards united, it takes up with its Body the inner ſeat of the Arm, and is inſerted with a thick Tendon into the innermoſt Prominency, ſomewhat faſten'd to the Ligament of the Joynt.

The Brachiæus. III. *The Brachiæus* is lay'd or ſpread underneath the former, and is altogether fleſhy, proceeding from the middle part of the Bone of the Arm, and terminating between the *Radius* and the Elbow, in the place where they are faſten'd together, this with the former moſt rightly bends the Elbow.

The Long. IV. *The Long Muſcle* ſhews it ſelf with a ſtrong, broad, but double beginning, the higher, from the lower Rib of the Omoplate; the other lower, which being joyn'd together, under the head of the Shoulder-bone terminates in the *Olicrane* or top of the Elbow.

The Short. V. *The Short one*, ariſing from the hinder Neck of the Arm, terminates in that

that part of the *Olicrane*, where the former ends, and upon which it reſts. This together with the former makes a ſtrong and ſinewy Tendon, by which the Arm is extended.

To theſe four Muſcles the two former are added by latter Anatomiſts.

The external Brachiæus. VI. *6. The External Brachiæus*, by *Riolane* ſo call'd, which is a Fleſhy lump, confounded with the *Long* and the *Short*, and inſerted into the ſame Part.

The Aconæus. VII. *The Aconæus*, which being but of a ſmall bulk, riſes from the lower part of the Shoulder behind, and runing along between the two Bones of the Elbow obliquely deſcends to the ſide of the Arm. Theſe if they are to be accounted particular Muſcles, muſt aſſiſt the Extenſion of the *Long* and the *Short*.

CHAP. X.

Of the Muſcles of the Radius.

FOur Muſcles move the *Radius*, of which the two innermoſt, which move it inward, are call'd *Pronators*. The two outermoſt which turn it outward are call'd *Supinators*.

The round Muſcle. I. *The firſt of the Pronatores, from its round form is call'd* Rotundus; which being produc'd from the inner part of the little ſwelling of the Shoulder runs with a Membranous Tendon, almoſt to the middle of the *Radius*.

The Quadratus. II. *The Second, which is the lowermoſt, and is call'd* Quadratus; being extended from the inner ſide of the Arm athawrt, proceeds above the Ligament, which faſtens the *Radius* to the Elbow, and is joyn'd to the inner part of the *Radius*.

The longer Supinator. III. *The firſt of the* Supinators, *which is the Longer*, ariſing from the Extream little Bunch of the Shoulder, deſcends to the lowermoſt top of the *Radius*.

The Shorter. IV. *The other proceeding from the External Apophyſis of the Arm*, terminates near the middle of the *Radius*.

Note, That although the Deſcriptions of the Muſcles of the *Radius* follow next in order to that of the Muſcles of the Elbow, however in demonſtrations the Muſcles of the Fingers, Thumb and Wriſt are firſt to be ſhewn; afterwards the Muſcles of the *Radius*, as being more commodiouſly to be ſeen, when the others are taken away.

CHAP. XI.

Of the Muſcles of the Wriſt, and Hollow of the Hand.

THE Wriſt is extended, bended, and moved ſideways by the benefit of four Muſcles, two external, and as many Internal.

The Palmary Muſcle. I. *Nevertheleſs, before theſe, the Palmary Muſcle is in the firſt place to be demonſtrated*, which is ſpread under almoſt all the Muſcles of the inner part of the Hand. It derives its Original from the inner little Bunch of the Shoulder, fleſhy at the beginning, afterwards attenuated into a ſlender Tendon, which paſſing beyond the Annulary Ligament of the Wriſt, is dilated into the ſinewy Membrane through the Hollow of the Hand, expanded to the Confines of the Fingers, ſo cloſely adhering to the Skin, that it can hardly be ſeparated from it. This by wrinkling the Skin, ſtrengthens the force of Graſping, and endues the Hollow of the Hand with an extraordinary Sence of Feeling.

Next to the *Palmary* Muſcle, lies a certain piece of Fleſh at the beginning of the inner part of the Hand, in the lower part of the *Mount of the Moon*, cloſe by the eighth little Bone of the Wriſt, ſometimes divided into two, ſometimes into three, outwardly repreſenting the form of two ſometimes three Muſcles, and is carried into the inner and middle part of the Hollow of the Hand, ſtretched under, and folded into, the Palmary Muſcle. This, by bringing the fleſhy Eminency lying under the Articular Finger to the *Tenar*, renders the Hand hollow, and forms a *Diogenes*'s Diſh.

The inner Cubitæus. II. *The firſt of the inner Muſcles of the Wriſt, called by the Name of the inner* Cubitæus, riſes from the inner Apophyſis of the Arm, and being faſtned to the Elbow, is inſerted with a thick Tendon into the fifth Bone of the Wriſt.

The inner Radiæus. III. *The Second, called* Radiæus internus, being produced from the

ſame place, is extended through the *Radius*, and terminates in the Bone which ſuſtains the *Index* of the *Metacarpus*. Theſe two clutch the Hand.

The firſt of the external Muſcles of the Wriſt, called the *External Radiæus*, or *Double-horned*, proceeding with a broad and two-fold Original from the bony Sharpneſs of the Arm, reſts with a fleſhy Subſtance upon the *Radius*, and with a double Tendon is inſerted into the firſt and ſecond Bone of the *Metacarpus*. This, by reaſon of its double Beginning, and double Inſertion, by ſome is deſcribed as double.

The External Cubitæus.

IV. *The other called the* **External Cubitæus**, riſes from the External *Apophyſis* of the Arm, and being carried through the Elbow, is inſerted with one Tendon into the fourth Bone of the *Metacarpus*, lying under the Little-finger. If only one or two of theſe four Muſcles act on one ſide, then the Hand is moved ſideways, and that either upward or downward, or in the middle, as either the External or Internal only, or both move together.

CHAP. XII.

Of the Muſcles of the Fingers and Thumb.

THE Fingers have ſeveral ſtrong Muſcles allotted them, as well to ſtrengthen them, as for the Performance of their various Motions; by which they are bended, extended, or moved ſide-ways. The *Sublime*, the *Profound*, and the *Lumbrical* bend.

The Sublime Muſcle.

I. *The* **Sublime, *which is alſo call'd the* Perforated**, ariſes from the inner Bunch of the Shoulder-bone, and is divided about the Wriſt into four Tendons, being as it were ſlit toward the end like a Chink, through which the Tendon of the following Muſcle paſſes, which are inſerted into the ſecond Internode of the Fingers.

The Profound Muſcle.

II. *The* **Profound, *called alſo the* Boaring-Muſcle**, riſes from the upper Parts of the *Elbow* and *Radius* a little below the Joynt, and paſſing in four Diviſions, with ſtrong Tendons through the Chinks and Clefts of the former, is inſerted into the third Bone of the Fingers.

The Channel of the Tendons.

III. ***Now that there may be a direct bending of the Fingers, and that the contracted Tendons may not riſe and lift up the Fingers, they are encloſed in a Channel compoſed of ſtrong Membranes***, and fat and oyly within-ſide, running the whole length of the inner part of the Hand, wherein they have a free Courſe.

The Lumbricals.

IV. ***Thoſe which are called the* Lumbricals**, riſing with a ſlender Subſtance from the Tendons of the *Profound* Muſcle, terminate in the firſt Internode with a round Tendon, intermix'd with the Tendons of the Inter-bone Muſcles. Sometimes mixing themſelves farther with the Inter-bone Muſcles, they run along the ſides of the Fingers, as far as the third Internode, and bend the Fingers ſide-ways.

The Extenders.

V. ***Muſcles of two ſorts extend the Fingers, ſome Common, others Proper.***

The common Extenders.

VI. ***The Common ones***, which ſerve to all the four Fingers, are two, riſing from the Extream Part of the Shoulder-bunch, which in their Progreſs unite together, and are firmly knit with united Tendons to the ſecond and third Bone of the Fingers. Whence *Sylvius* and *Riolanus* deſcribe them for one Muſcle, which they call by the Name of the *Great Extender*, or *Magni Tenſoris*.

The Proper.

VII. ***Thoſe called Proper***, being ſuch as extend one Finger only, are of two ſorts.

The Extender of the Fore-finger.

VIII. ***The Firſt, the proper* Extender *of the Fore-finger***, which it has beſides the Common one, by *Riolanus* and *Veſlingius* called the *Indicator*, riſing from the middle and extream Region of the Elbow, and is inſerted with a forked Tendon into the ſecond Articulation; of which two Tendons, the other unites with the Tendon of the Common *Extenſor*.

The Extender of Little-finger.

IX. ***The other is the proper* Extender *of the Little-finger***, which riſing from the upper Part of the *Radius*, and running between the Elbow and the *Radius*, is externally inſerted with a double Tendon into the auricular Finger, one of which intermixes with the Tendon of the common Extenſor.

The Interoſſei.

X. ***The Fingers are drawn ſide-ways, either toward the Thumb, or from it, by the Aſſiſtance of the eight Inter-bone Muſcles***; of which, the four innermoſt obtain the Interval be-

between the Bones of the *Metacarp*; the four outermoſt being placed in the Palm of the Hand, reſt upon the upper ſide of the former. They riſe from the upper Part of the *Metacarp* near the Wriſt; thence ſometimes alone, ſometimes united with the Lumbricals, with their Tendons, creep along the ſides of the three Bones of the Fingers, to the very Root of the Nails, where the Tendons uniting above and below, terminate. From theſe the middle and Ring-finger receive two Tendons, the Fore-finger and Little-finger one; *Galen* believes the hinder Bones of the Fingers to be extended alſo by theſe Muſcles.

Beſides the Lumbricals aforeſaid, there are two proper Muſcles that move ſide-ways.

The Adductor of the Fore-finger.

XI. *The firſt is the proper Adductor of the Fore-finger*, by ſome confounded with the proper *Extenſor* of the Fore-finger, which riſes from the firſt internal Internode of the Thumb, terminates in the Bones of the Fore-finger, and brings the Fore-finger toward the Thumb.

The Adductor of the Little-finger.

XII. *The other, called the proper Adductor of the Little-finger*, and which *Riolanus* believes may be ſlit in two, takes its riſe in the Hollow of the Hand, from the third and ſecond Bone of the Wriſt, of the ſecond Order, and is inſerted into the ſide of the firſt joynt of the Little-finger, and draws it from the reſt of the Fingers.

The Extenders of the Thumb.

XIII. *The Thumb, which is equal in ſtrength to all the reſt of the Fingers, is extended by the Benefit of two long Muſcles*, which ariſe from the exterior ſide of the Elbow; of which, the one reaches to the third Internode. The other carried beyond the Wriſt, is inſerted without-ſide with a double Tendon, into the firſt and ſecond Joynt of the Thumb.

The Benders of the Thumb.

XIV. *It is bended by two Muſcles*, the one a ſtrong one, which riſing from the upper part of the *Radius*, runs forth to the firſt and ſecond *Internode* of the Thumb; the other of a leſſer Bulk, which proceeding from the Bone of the Wriſt, is ſpread underneath the other, and extended to the middle of the Thumb. *Riolanus* will not acknowledge this latter for a *Bender*, but believes the Muſcles riſing from the Bones of the Wriſt and *Metacarp*, to be the Adductors and Abductors.

The Adductors of the Thumb.

XV. *It is drawn to the other Fingers by three Muſcles*, proceeding from the three lower Bones of the *Metacarp*, and inſerted into the ſecond Bone of the Thumb.

The Abductors.

XVI. *It is drawn outward by two Muſcles*, of which, the one ariſing from the inner Bone of the Wriſt, which ſuſtains the Thumb, is inſerted into the ſecond Internode of the Thumb, with a membranous Tendon. The other poſſeſſing the Space between the Thumb and Fore-finger, riſes from the hinder Seat of the Bone of the *Metacarp* that lies under the Fore-finger, and with a fleſhy Subſtance, is inſerted into the Internode of the Thumb, all along the outermoſt ſide, whence it ſends a membranous Tendon to the ſecond.

CHAP. XIII.

Of the Muſcles of the Thigh.

IN regard the Office of the Foot is to walk and ſtand, which conſiſts in Fixation and Motion, for that in walking, while one Foot is ſet to the Ground, the other ſtill moves forward; for the Performance of both theſe Offices, there is a neceſſity of various Muſcles, of which, ſome move the Thigh, others the Leg, others the Feet, together with the Toes. The Thigh is extended, bended, brought forward, carried backward, and turned about. Three Muſcles therefore bend the Thigh.

The Lumbar Muſcle.

I. *Firſt, the Lumbar Muſcle*, which is for the moſt part round, thick, and livid, and ſeated in the hollow Capacity of the *Abdomen*. It ariſes with a fleſhy Beginning about the two lower Vertebers of the Breaſt, and the three upper Vertebers of the Loyns, and deſcending along the inner Superficies of the *Ilion* Bone is inſerted with a round and ſtrong Tendon into the leſſer little Wheel of the Thigh, in the higher part before, and ſtrongly draws the Thigh upward. But becauſe the Reins lye upon this Muſcle, being endued with a remarkable Sinew, in the ſame place where the Sinew enters them; hence it comes to paſs, that if any Stone be in the Kidneys, there happens a Numneſs in the Thigh on that Side, by reaſon of its Compreſſion.

Over this, ſometimes is ſpread the other ſmall Muſcle, called the ſmall

Lumbal, which where it begins for about a Fingers length, being carried over the *Lumbal* it ſelf, fleſhy, ſlender, and with a flat Tendon, terminates together with the *Lumbal* and *Iliac*, cloſely embraces it and keeps it firm in its Seat. This *Riolanus* reports is not to be found in Women. *Bartholine* alſo writes, that in the Year 1651. he ſaw another *Pſoa*, ſomewhat bigger than this, about the breadth of three Fingers, which bending outwards more to the ſides, lay partly under the great *Lumbal*, and laſtly, was inſerted with a fleſhy Subſtance into the upper edge of the *Iliac* Bone, where the inner *Iliac* Muſcle riſes.

The inner Iliacus. II. 2. *The Internal Iliacus*, which with a ſlender and fleſhy beginning riſing in the inner Concavity of the *Ilian* Bone, unites with its Tendon to the *Lumbal*, and terminates forward between the greater and the leſſer Trochanter.

The Pectineus. III. 3. *The Pectineus*, which is of a livid Colour; this riſing broad and fleſhy from the upper part of the Share-bone, near the Commiſſure, cloſe by its Griſtle, is inſerted with a ſhort and broad Tendon into the inner ſide of the Thigh, and ſtarts out to the hinder Parts, where the Thigh bends ſtrongly upward and inward, and by that means one Thigh is laid upon another. And therefore not without reaſon, it is by *Bartholin* referred to the *Adducting* Muſcles.

Three Muſcles extend the Thigh, which are called *Glutæi*, and conſtitute the Buttocks, and are beſides ſerviceable to the Act of Walking.

The larger Glutæus. IV. 1. *The larger* Glutæus, which riſing very fleſhy from the *Coccyx*, the Spine of the *Os Sacrum*, and the Rib of the *Ilion* Bone, terminates with a ſtrong Tendon four Fingers below the great *Trochanther*.

The middle Glutæus. V. 2. *The middle* Glutæus, both for ſituation and bigneſs, is for the moſt part ſpread under the former. This ſpringing forth with a fleſhy Beginning from the Rib and Back of the *Ilion* Bone, in the Forepart, and poſſeſſing almoſt the whole Region of the *Ilion* Bone, is inſerted with a broad Tendon into the foremoſt and higher part of the bigger *Trochanter*, girdling it every way.

The leſſer Glutæus. VI. 3. *The leſſer* Glutæus, which lies altogether hidden under the ſecond; this comes out of a fleſhy Subſtance from the back of the *Ilion* Bone, and from the hinder and lower Seat of it, and is inſerted with a ſtrong and robuſt Tendon into the inner Part and Top of the larger *Trochanter* or Extuberance of the Thigh.

The Triceps *Adductor.* VII. *The three-headed Muſcle draws the Thigh inward*, which from its fourfold Beginning, according to *Fallopius*, *Bauhinus* and *Riolanus*, more truly deſerves to be called the *Four-headed Muſcle*. This is the thickeſt of all the Muſcles in the whole Body, of which, the ſeveral Parts, as they vary in their riſe and Inſertion, ſo alſo in their Fibers, and ſomewhat as to their uſe. For which Reaſon, *Bartholinus* divides it into three Muſcles, though he had done better to have made it four.

The firſt part riſes with a ſinewy Beginning from the upper Line of the Share Bone, and is inſerted into the rough Line of the Thigh.

The ſecond comes out from the loweſt Commiſſure of the Share-bone, and terminates in the ſharp Line of the Thigh, at the upper Part.

The third Part ariſes from the whole lower part of the Hip, and is inſerted into the hinder rough Line of the Thigh under the leſſer *Rotator*.

The fourth Part proceeding from the Top of the Hip with a round Tendon, which unites with a ſlender Tendon of a Portion of the firſt Part, terminates in the inner and inferior Extuberance of the Thigh.

Riolanus writes, that the firſt part is inſerted into the middle of the Thigh, the ſecond below the Neck, and that the third extends it ſelf with a moſt robuſt Tendon to the Extremity of the Thigh.

They who allow but three beginnings to this Muſcle, inſtead of a fourth beginning, add to it a peculiar Muſcle, which *Riolanus* calls the *Pectineus*, *Veſlingius* the Livid Muſcle, which indeed is but the forth part of the Three-headed Muſcle.

The Quadrigemini. VIII. *Four ſmall Muſcles bring the Thigh to the outer ſide, called* Quadrigemini, becauſe they are almoſt alike one to another, and alternately placed in the Part behind, above the Articulation of the Thigh.

The firſt and uppermoſt *Quadrigeminus*, from its Pear-like Shape, call'd *Pyriformis*, from its Situation, the external *Iliacus*, comes out from the lowermoſt Part of the *Os Sacrum*. The ſecond from the Extuberance of the Thigh-bone. The third contiguous to it from the ſame place. The fourth called

Qua-

Quadratus, broader and more fleshy than the rest, and about two Fingers breadth distant from the Third arises from the inner part of the Protuberancy of the *Ischion*, and terminates in the External part of the great *Trochanter*.

The Obturatores. IX. *Two Muscles wheel the Thigh obliquely, call'd the* Coverers *or* Obturators, which possess an open hole between the Share-bone and the Thigh-bone, and assist the Thigh in going backward; one Internal, the other External.

The Internal which is the stronger, proceeding fleshy and broad from the inner Circumference of the said Hole, and being carry'd transversly outward above the Hip, with a three headed Tendon, passing through a Purse for securities sake, enters the Concavity of the great *Trochanter*, and there causes external Rotation.

The External, which lyes under the *Pectineus*, beginning from the outward Circumference of the said Hole, with a fleshy substance, and winding through the neck of the Thigh, like a Periwincle shell is inserted into the Concavity of the Great *Trochanter* with a large and strong Tendon, and directs Internal Rotation.

Note, that although the Muscles of the Thigh, in the order of Demonstration hold the first place, yet in dissection they cannot so commodiously be shewn unless the Muscles of the Leg be first remov'd. Which are therefore in demonstrations first to be shew'd.

CHAP. XIV.

Of the Muscles of the Leg.

The Quadrigemini. THE Leg is mov'd three ways, bent, extended and mov'd obliquely.

Five Muscles bend the Leg.

The longest I. 1. *The* Longest, *also called* Fascialis, or the *Swath-band* Muscle, presently occuring before, under the Skin rises with a Sinewy and fleshy beginning from the inner Extuberance of the *Ilion*-bone, and being spread, slender as it is, like a Swath-band over other Muscles, is carry'd through the inner Parts of the Thigh, and terminates near the Knee, in a Tendon, which is inserted into the fore-part of the Shin-bone, in an acute Line; and therefore *Riolanus* not without reason justifies, that this Muscle rather extends the Leg than brings it inward.

II. 2. *Call'd* Gracilis, *or Slender*, resting toward the inside upon the Longest, rises at the Commissure of the Share-bone, with a large and Sinewy beginning, and running out into the inner Parts of the Thigh, is inserted into the inner part of the Leg with a round Tendon. *The Slender.*

III. 3. *Call'd the* Seminervous, rising from the Extuberancy of the *Ischion*, with a nervous and slender beginning, obliquely descends through the hinder and inner Parts of the Thigh, and terminates with a round Tendon, in the hinder and inner Part of the Leg, and its Tendon runs out into the middle of the Leg. *The Seminervous.*

IV. 4. *The Fourth call'd the* Semimembranous, rises from the same place and extends it self to the hinder part of the Leg with a Tendon somewhat broader. *The Semimembranous.*

V. 5. *The Two-Headed Muscle*, proceeds from the same Extuberancy of the Hip, and in being carry'd through the External Part of the Thigh, and about the middle of the Thigh assuming a new fleshy Lump, as it were a new Muscle, and so descending downward, is inserted with a remarkable Tendon, into the Process of the Bone of the Button in the lower Part. *The two-headed.*

This Muscle has been observ'd, to have a double Rise and Termination: for that Reason by *Vesalius* call'd the double Muscle.

To the Extention of the Leg belong five or six Muscles.

The Membranous. VI. 1. *The* Membranous proceeding accute and spiny from the upper Spine of the *Ilion* bone; in the outer Part, near the larger Process of the Thigh it alters into a very long and broad Membrane, which like a transverse Ligament, therefore call'd the broad swath-band enfolds all the Muscles of the Leg and Thigh, and by that means keeps them fix'd in their seat, running out to the extream Part of the Thigh.

It is intermixt, about its insertion with the Tendons of the following Muscles, and is inserted into the fore Part of the Leg and Button, toward the outer side; and extends the Leg right forward, and draws it, as others affirm, somewhat outward.

VII. *The*

The long. VII. 2. *The* Long *Muscle, by* Riolanus *call'd* Sutorius, *by* Vesslingius *Fascialis*, rises from the foremost Appendix of the *Ilion*-bone, and carry'd with an oblique course through the inner Parts of the Thigh, descends under the Knee to the Leg, within side, and extending it, brings it to, and lays one upon the other, after the manner of Shoo-makers.

The streight. VIII. 3. *The* Streight *Muscle*, growing from the lower Spine of the *Ilion*-bone, runs along with a fleshy and round Belly all the length of the Thigh, and with a strong and round Tendon including the little dish, terminates under it in the Leg.

The internal vast. IX. 4. *The Internal vast Muscle*, arising from the Neck and lesser *Rotator* of the Thigh, is inserted into the Leg with inside a little below the small Cup.

The external vast. X. 5. *The External vast Muscle*, taking its rise more outwardly from the lesser *Rotator* of the Thigh, terminates a little below the small Cup, with a large Tendon in the outer part of the Leg.

The Cruræus. XI. *To these five Extensory Muscles some there are who add a sixth Muscle adhering to the Thigh, which they call* Crureus; whose Original they place between the two *Rotators* of the Thigh, and give it the same ending with the Vast Muscles.

The four last of these Extensory Muscles uniting together about the Knee, from one common broad and strong Tendon, wherewith they involve the Cup, and strongly bind together the Bones of the Thigh and Leg.

The Popliteus. XII. *The Poplitan or Ham-Muscle*, brings the Leg obliquely to, lying hid in the hollow of the Ham, and rising from the lower and exterior Extuberance of the Thigh, and carry'd obliquely through the hinder and inner part of the upper Appendix of the Leg, is inserted therein, with a square body. This Muscle *Riolanus* asserts, that he has seen double.

CHAP. XV.

Of the Muscles of the Foot or Ball of the Foot.

THE Foot is bent, extended, and mov'd sideways.

Two Muscles before bend the Foot upward.

The Tibialis anticus. I. 1. *The Tibial before*, arising from the upper part of the Leg and Button, adheres to the whole Leg upon the outside. Thence running out under the annular Ligament of the Foot, terminates in the Bone of the Ball under the great Toe. Sometimes it is divided under the Ligament of the Foot into two Tendons. Of which the one is inserted into the first nameless Bone, the other is inserted into the Bone of the *Metatarsus* just before the great Toe. This Muscle, where it winds back under the Ball, is furnish'd with a Gristle and a little *Sesamoides* Bone.

The Peronæus anticus. II. 2. *The Peronæus before*, which all along its whole Progress is joyn'd to the side of the Preceding Muscle, and terminates in the outer side of the Leg. This beginning fleshy and nervous from the upper part of the Button, and passing the fissure of the External part of the Heel, with a strong Tendon, sometimes parted into two, is fix'd into the Bone of the *Metatarsus*, which sustains the little Toe. When the Muscle is parted in two, then the bigger part of it runing obliquely under the Sole of the Foot, is inserted into the Bone of the *Pedion* just against the great Toe. But when the Tendon is divided, then the beginning of it uses to be double; that is one from the upper part of the Button, the other from the middle of the Heel: And hence it is that some Anatomists make two Buttons of it.

Three Muscles extend the Foot; call'd by the Names of *Gastrocnemius*, *Soleus*, and *Plantaris*; of which the two first by means of their thickness and bulk, constitute the belly of the Calf.

The Gastrocnemius. III. *The Gastrocnemius*, rises with a twofold beginning from the Internal and External head of the inside of the Thigh, under the Ham; and by reason of its double beginning is taken for two Muscles. This, growing out into a tumid belly, at the lower part by means of a strong Tendon

Tendon united with the Tendon of the *Solous*, is inſerted into the Heel.

The Soleus. IV. *The Soleus*, ſo call'd from a Fiſh nam'd a *Sole*, is a Muſcle broad and thick, which riſing from the hinder and uppermoſt Commiſſure of the Leg and Button, and uniting a little above the Heel, with the Tendon of the *Gaſtrocnemius* is inſerted into the hinder part of the Bone of the Heel.

The Plantaris. V. *The Plantaris* lyes hid among the reſt in the Ham, and proceeds with a ſmall and fleſhy body, from the outermoſt head of the lower part of the Thigh, and then terminates under the Knee into a long and ſlender Tendon: which being cloſe united with the Tendons of the *Gaſtrocnemius* and *Soleus* is fix'd into the Heel, and extends it ſelf half way to the bottom of the Foot.

Theſe three Muſcles toward the end are intermix'd together, and form one ſtrong Tendon inſerted into the hinder part of the Heel, which by reaſon of its extraordinary ſtrength, is call'd the *Great Cord*, the wounds of which are very dangerous cauſing Fevers, Hickups and Convulſions. *Veſlingius* believes this Tendon not only to be inſerted into the Heel, but alſo to extend it ſelf to the very confines of the Toes. However, that before its inſertion, by reaſon of the Prominency of the Heel-bone, it ſeparates ſomewhat from the Leg, and forms that ſpace, where *Achilles* ſo luckily hit *Hector* when he flew him.

The Tibialis poſticus. VI. *The hinder Tibial Muſcle* moves the Foot inward, which riſing between the Leg and the Button and affix'd to the whole Leg, runs out underneath to the Bone of the Ball, which is faſten'd to the Cube-form'd-bone. Sometimes it produces double Tendons, of which one is inſerted into the Navicular-bone, the other into the firſt Nameleſs-bone.

The Peronæus poſticus. VII. *The hinder Peronæus* draws the Foot outward, which being produc'd from the upper and hindermoſt part of the Button, and carry'd through the fiſſure of the external part of the *Malleoles*, together with the foremoſt *Peronæus*, with a hard and round Tendon, ſeparated from the Tendon of the *Antic Peronæus*, winds towards the lower Parts of the Feet, about the Region of the cube-form'd-bone, and carry'd below the *Pedion*, is inſerted into the Root of the large cube-form'd-bone, which is plac'd before the Thumb. *Riolanus* numbers this *Poſtic Peronæus* among the Benders, perhaps becauſe it bends the Foot at the ſame time it carrys it away.

The third Peronæus. VIII. *Sometimes, though very rarely a* Third Peronæus *is found*, very ſlender, which runs forth together with the *Poſtic*, through the lower Parts of the Foot, nothing different either in its inſertion or uſe, though much inferiour in ſtrength.

CHAP. XVI.

Of the Muſcles of the Toes and great Toe.

THE Toes have ſeveral Muſcles, which bend, extend and move them obliquely.

The four leſſer Toes are extended by two Muſcles which are call'd *Tenſors*.

The long Tenſor. I. 1. *The long Tenſor*, which being hid under the fore-part of the Leg, riſes from the fore-part and inner part of the Leg, where it is joyn'd to the Button under the Knee. Hence it deſcends in a ſtreight Line all along the length of the Button, and ſeparated into four Tendons, paſſes beyond the Annulary Ligaments, and is inſerted into the three Articulations of the four fingers at the upper part.

The ſhort Tenſor. II. 2. *The ſhort Tenſor*, riſing not far from the Bone call'd *Aſtragalus* at the upper part, and ſpread under the long *Tenſor*, thruſts it ſelf into all the Joynts of the firſt Internode with its Tendons, which are croſs'd like an X with other long Tendons above the *Meta-Tarſus*.

The four leſſer Toes are bent by ſix little Muſcles call'd *Flexores* or Benders.

The long Bender. III. 1. *The long Bender or broad, and ſublime*, which together with the following ſhort-lyes hid behind under the Muſcles that conſtitute the Calf. This derives its Original from the upper part of the Muſcle behind, and about the inſide of the *Malleolus* creeping under the Ligament of the Leg and Heel, in the Sole of the Foot is ſhiver'd into four Tendons, which paſſing through the Holes of the ſhort Flexor is inſerted into the third Articulation of the four Toes.

IV. *The*

The short Bender.

IV. 2. *The short Flexor* which is also call'd the *Bor'd* and *Deep* proceeds more below, and more inwardly from the Heel, and sending forth four Tendons, divided toward the end with a cleft at the passage of the Tendons of the preceding Muscle, runs forth into the second internode of the Toes.

The Lumbrical.

V. 3, 4, 5, 6. *Call'd the four* Lumbrical *Muscles*, proceeding from the Tendons of the long and short *Tensor*, or rather from the Ligament enfolding them, and augmented by a certain piece of flesh rising from the Heel, are inserted with their Tendons into the first Internode of the four lesser Toes, with their several Tendons.

Bartholinus, writes that he has observed another *Flexor* of the little Toe, rising from the head of the Leg, and divided into two Tendons about its insertion into the Toe.

The interossei.

VI. The oblique Motion of the Toe is perform'd by ten Inter-bone Muscles, seated both in and between the Bones of the *Metatarsus*, and springing from a fleshy mass; of which the External terminate in the first Internode of the Toes; the innermost run forth to the second Internode, by the first the Toes are drawn outward, by the second they are bent inward; and when both act together, they are extended.

The Abductor of the little Toe.

VII. *The litle Toe has a peculiar Abductor* proceeding from the Heel, and fix'd without side to the fifth Bone of the *Metatarsus*; which is inserted into the outmost side of the first Internode.

The great Toe has several Muscles.

The Flexor *of the great Toe.*

VIII. 1. *The Flexor*, joyning to the long *Tensor* of the Toes, which rises more behind with a Fleshy substance from the upper part of the Button, and following the Boaring Muscle, is fasten'd with a strong Tendon to the third Bone of the great Toe. Sometimes it is divided under the Sole of Foot into two Tendons, of which one goes to the great, the other to the second Toe; and then the long *Flexor* sends but three Tendons to the other Toes.

The Extensor.

IX. 2. *The Extensor* rising from the outer side of the Leg, where the Button goes back, and creeping through the upper Parts of the Foot, is inserted into the whole great Toe on the upper part. Sometimes it sends forth a double Tendon, one to the last joynt of the great Toe, the other to the Bone of the *Metatarsus*, that lyes under the great Toe.

The Abductor.

X. 3. *The Abductor* proceeding from the inner part of the Heel, and being fasten'd to the inner side of the Foot all the length of it, is fasten'd without side into the first Bone of the Thumb.

The Abductor Major.

XI. 4. *The Abductor Major* arising from the Ligament of the Bone of the *Metatarsus*, which lyes under the little Toe and the next to it, terminates with a short and strong Tendon, in the first Joynt of the great Toe in the inner Part.

The Abductor Minor.

XII. 5. *Abductor Minor*, by *Casserius* call'd the Transversal proceeding from the Ligament of the little Toe, which binds the first Internode, is carry'd transverse and fleshy, and stretches it self more inwardly to the first Bone of the great Toe, with a short and broad Tendon. To this some ascribe another Use, believing it there apply'd to gather together the first Bones of the Toes. *Riolanus* believes that it serves only for a Pillow, least the Tendons should be injur'd by the hardness of the ground and the Bones. *Casserius*, who is said to be the first Discoverer of this Muscle, will have it assign'd to bring the great Toe toward the little Toe, thereby to make the foot hollow, for the more easie walking in Stony and unequal places, by the more firm taking hold of the step.

The Vestiginum.

XIII. *In the flat of the Foot, which is called* Vestigium, *or the Footstep*, there is to be observ'd a Fleshy mass, which like a Cushion, lyes under the Muscles and Tendons. Which some confound with the Universal Muscle.

AN

AN APPENDIX Concerning the MEMBRANES and FIBRES.

CHAP. I.

Of the Membranes in General.

Definition. I. *A Membrane is a white similar part, broad, flat, thick, and extensible, produc'd out of the clammy and viscous part of the Seed, preserving, containing, gathering together, corroborating and disterminating the Parts that lye under it or contained within it.*

The Names. II. It was call'd by the Antient ὑμὴν, μήνιγξ, and χιτὼν. All which words at that time signify'd one and the same thing. Afterwards these words became particular, and were attributed to particular Membranes. For now *Hymen* properly signifies that Membrane which resides in the Neck of the Womb, vulgarly called *Claustrum Virginitatis*, the *Fence of Virginity*. *Menina*, signifies that Membrane that enfolds the *Brain*. And χιτὼν or *Tunica*, is the general Name for all Membranes that cover the Veins, Arteries, Ureters, *&c.* At this day Membrane is a general word, signifying any Membrane that enfolds a fleshy Part, the *Pericardium*, *Periosteum*, *Peritonæum*, the Membrane of the Muscles, *&c.*

Original. III. *There can be hardly any certain Original of the Membranes describ'd*; as being Parts subsisting of themselves, form'd out of Seed, and every where conspicuous in the Body. Many have with probability enough deriv'd them from the *Meninxes*. *Lindan* writes, that the Substance of the Heart is wrapt about with a very transparent and very thick Membrane, which he believes to grow from the dilated Extremities of the Fibres of the Heart, and thence would have us consider whether all the rest of the Membranes do not arise by a certain Propagation from this Membrane of the Heart. But these are mere Conjectures, hardly credible; rather it is to be said, that the Membranes are Spermatic Parts, form'd with other Spermatic Parts, out of the Seed at the first formation of the Embryo, and that therefore they have no other Original than the Seed.

Their Nourishment. IV. *The Membranes are nourish'd like the rest of the Parts by Arterious blood*, flowing out of the Arteries into their Substance, and fermented therein, by the mixture of Animal Spirits, the residue of which either unapt for Nourishment or superfluous, is carry'd back through the Tubes of the Veins, into the hollow Vein.

The office. V. *Now the Membranes are the Organs of Feeling*, for all the sensible Parts, even the Nerves themselves, feel by the help of the Membranes only: which those Parts that want are destitute of sence, as the Bones, Gristles, the fleshy Parts of many Bowels, wherein the Sence of Feeling no farther extends it self then to the Membrane that enfolds it.

This Faculty of Feeling is bequeathed to them by the Animal Spirits continually flowing into them through the

Nerves, which influx ceasing, the Sence of Feeling also fails, as in Apoplexies, Palsies, &c. Such Membranes also into which few Spirits flow, are dull of Feeling. Thus Veins and Arteries are said to be void of Sence, because they feel but dully.

The differences. VI. *The Differences of Membranes are many.* In respect of their Substance; some thin, some thick, some legitimate, as the *Pleura*, *Periosteum*, &c. Others illegitimate, as being rather Membranous Bodies, such are membranous Ligaments, Tendons, the Stomac, Intestines, Bladder, &c. In respect of their Figure, some broad, some long, some triangular, &c. In respect of their Situation, some inward, some outward.

The number. VII. *The number of the Membranes is almost infinite,* but the most considerable are these that follow.

In the Birth, the *Chorion*, *Amnios*, the *Urinary Membrane*, and in Brutes, the *Alantois*.

In the whole Body of Man, the *Cuticle*, the *Skin*, the fleshy *Pannicle*, the *Membranes* of the *Muscles*, the *Periostea*, and the *Membranes* of the *Vessels*.

In the Head without, the *Pericranium*, more inward, both the *Meninxes*, which descend from the *Cranium* into the *Spinal Concavity*, involving the *Spinal Pith*, and extends themselves the whole length of the Nerves.

In the Eye, seven Tunicles, the *Nameless*, the *Conjunctive*, the *Horny*, *Uveous*, *Net-like*, *Spiders Web*, and *Vitreous*.

In the Ear, the Membrane of the *Tympanum*.

In the Mouth, the *Tunicle* proper to the *Tongue* and *Palate*, as also that which is common to the *Mouth*, the *Chaps*, the *Gullet* and *Stomach*.

In the Breast, the *Pleura*, the *Mediastinum*, the *Pericardium*, the *Tunicle* investing the *Lungs* and *Heart*, and the *Valves* of the *Heart*.

In the lower Belly, the *Peritoneum*, *Epiploon*, the *Mesenterie*, and the Membranes that enfold the several Bowels; as also those of which the Intestines, the Bladder, and other Parts are composed.

Of all which primary Membranes, mention has been already made in their proper Places.

Besides these, there is an infinite number of thin Membranes that have no Names.

CHAP. II.

Of the Fibres.

Fibres are white similar Parts, solid, oblong, like little Strings, designed for the Motion of some, and the Preservation of other Parts.

Their Originall. I. *They are Parts which are not derived from others, but existing of themselves, for the Complement of those Parts where they are required.* And therefore they mistake, who believe them to be produced from the Brain, or from the Spinal Marrow, as are also they who think them the Productions of the Nerves, it being impossible that the Nerves should be expanded into so many Strings. For Example, a small Nerve, which shall consist of twenty fibrous Strings, is inserted into some larger Muscle, consisting of a hundred fibrous Strings, much bigger and stronger than those in the Nerve. Thus the whole Body of the Heart is fibrous, whereas it has very few, and those very small Nerves. The Fibres indeed communicate with the Nerves, so far as they receive Animal Spirits from them, yet they are no more Productions from them, then the Veins are Productions of the Arteries, from whence they receive Blood.

Therefore they are Parts existing of themselves, united to others for common use.

Their Action. II. *Their Action is, to be contracted into one another.* Though *Riolanus* believes, that rather Use than Action is to be attributed to them.

All the Muscles are moved by Fibres, which being cut or wounded, their Motion ceases. Therefore the wonderful Contexture of the Fibres of the Heart, is the reason that it is able to endure such a continual Motion. The Stomach, Intestines, Womb, Bladder, and the like Parts are furnished with Fibres, the more to strengthen them in Retention and Expulsion. Lastly, all the Parts that are appointed for actual Performance, are full of Fibres. However, some do question whether there be any such things as the little Fibres of the Brain, Lungs and Liver, and *Fallopius* positively denies them; but now adays there is no Body doubts of them, more than that the Arteries and Veins are not without Fibres; though *Fallopius* and *Vesalius* will hardly admit them, be-

becauſe they are ſo very ſmall: however *Fernelius Briſot*, *Fuchſius*, and other eminent Men allow them, for the Strength and Preſervation of the Vein, and teach us that their ſtreightneſs is to be obſerved in Blood-letting. And this Experience teaches us in Warts, when the orbicular and oblique Fibres being broken, the Tunicle of the Veins will be extended after a ſtrange manner, nor can ever be again contracted or reduc'd to its firſt Condition.

Difference. III. ***Vulgarly there is a threefold difference obſerved from their Situation.*** Some are ſtreight, which are extended at full length; ſome are tranſverſe, which intercut the ſtreight ones; others oblique, which mutually cut both. But to theſe three differences we muſt add orbicular Fibres, as in the Sphincter Muſcle, unleſs you will reckon them among the tranſverſe ones. The ſtreight ones, are vulgarly ſaid to attract, the Oblique to retain, the Tranſverſe to expel; which three Diſtinctions, *Fallopius*, not undeſervedly derides, and teaches us how that all the Fibres expel, but that none in reſpect of themſelves either attract or retain.

But the Parts that perform one ſingle Action, have ſingle Fibres, as ſeveral Muſcles whoſe Action is ſingle, that is to ſay, Contraction. But they that perform many Actions, are furniſhed with various Fibers, as the Inteſtines which retain and expel, to which the ſtreight ones are added to ſtrengthen and corroborate. But the Membranes which ought to be every way fitted and prepared for Action, have Fibres ſo intermixed, that their whole Subſtance ſeems to be but a Contexture of Fibres joyned together.

THE SIXTH BOOK OF ANATOMY.

Treating of the ARTERIES.

CHAP. I.

Of the Arteries in General.

IN the Body of Man there are three Veſſels that go under the Name of Arteries.

1. The *Aſpera* or *Trachea*, *Lib.* 2. *Cap.* 16.

2. The *Pulmonary*, by ſome erroneouſly called the Arterious Vein, *Lib.* 2. *Cap.* 9.

3. The *Great Artery*, or *Aorta*, to be diſcourſed of in this Book.

Definition. **I.** ***This great Artery is an Organic Similar Part, oblong, round, hollow, appointed for conveighing the Spirituous Blood.***

It is called *Organic*, becauſe it is appointed for a certain Uſe, that is, to conveigh the Blood.

It is called *Similar*, not in a ſtrict, but profunctory ſence. For though it be thought to be compoſed of Fibres and Membranes, yet becauſe it is every where compacted after the ſame manner, the Artery in the Hand not differing from the Artery in the Foot, or in any other Part, hence it is reckoned among the ſimilar Parts.

It is ſaid to be appointed to carry or convey the Spirituous Blood.

The Arterious Blood, what it is?

II. ***Not that the Arterious Blood is altogether ſpirituous, but the greater Part of it is ſuch, from which greater Part the Denomination is taken.*** For ſome Parts of it are more, others leſs Spirituous. For when the *Chylus* being mixt with the Blood of the hollow Vein, enters the Heart the firſt time, it does not preſently obtain ſo great a Subtilty, Attenuation, and Spirituoſity, as thoſe Particles of the Blood mixed with the *Chylus*, have obtain'd, which have paſſed many times through the Heart by Circulation, and have been many times dilated therein. For as in the Diſtillation of Wine, the oftner it is diſtilled, the more ſubtil, the more pure and efficacious the Spirit is, which is drawn off from it; ſo the Blood, the oftner it is dilated, the Spirituous Particles are the better ſeparated from the thick Maſs, and the more attenuated, and what is not yet ſo perfectly attenuated, and conſequently leſs fit for Nouriſhment, returns through the Heart again, to be therein more perfectly dilated.

And

And therefore, I admire at the Learned *Ent*, who ſays that the Arterious Blood is worſe than the Veiny Blood, whereas the firſt is far more ſpituous than the latter. But, ſays he, it is much thinner and more ſerous than the veiny. However it is much more ſpirituous; whence that thinneſs, which ſeems to be Seroſity, though it be not ſo. Thus Spirit of Wine is thinner and more fluid than Wine, is it therefore more ſerous and worſe? But, ſays he, the Arterious Blood has left much of its oyl in the Lap of Life, the Heart. I deny it, for there is no Compariſon to be made between a lighted Lamp and the Spiritification of the Heart, *Vid. Lib.* 2. *C.* 13.

Beſides the Blood, the Arteries ſometimes by Accident, carry depraved and corrupt Humors mixt with the Blood, though there be no mention made of this in the Definition, becauſe it is not their deſigned uſe.

Whether they attract Air?

III. *Andreas*, *Laurentius*, *Emilius*, *Pariſanus* and others, believe, that the Arteries attract Air through their Ends and inviſible Pores to cool and ventilate the Blood. But then there would be two contrary Motions at the ſame time in the ſame Arteries, of the Blood puſh'd forth to the Exterior Parts, and of the Air entring the inner Parts, which can never be. Beſides, there being a neceſſity that the Vital Spirits ſhould be conveighed through the Heart through all Parts of the Body, it would be a dangerous thing to cool that Heat ſo neceſſary to Life, eſpecially in cold and phlegmatic People.

Whether they diſſipate Vapors?

IV. *Rolfinch* believes the Arteries ſerve for the Diſſipation of Vapors. But the thickneſs of their Subſtance declares this to be falſe, that nothing, or very little of ſpirituous and ſerous Liquor can exhale through it, but leſs what is thick and earthy as aduſt Vapors, therefore thoſe aduſt Vapors are diſſipated and ſeparated from the Blood, when the Blood is poured forth out of the Arteries into the Subſtance of the Parts, whoſe larger Pores are proper to evacuate thoſe aduſt Vapors, either inſenſibly or by Heat.

More abſurd are they, who believe the Blood to be carried through certain Arteries to the right Ventricle of the Liver, and through certain others from the Spleen to the left Ventricle of the Heart, and as ridiculous are they, who think they carry nothing but Vital Spirits, and no Alimentary Blood.

Bartholin believes the *Limpha* to be carried through the Arteries, and with him *Rolfinch*. For that the *Lympha* being mixed with the Chylus and veiny Blood, when the whole Maſs is dilated in the Heart, it ceaſes to be *Lympha* any more. Nor do any Lymphatic Veſſels open into the Arteries in the Midway; neither do the Arterious Blood, when ſufficiently ſpirituous, ſtand in need of that fermentaceous Liquor.

The great Artery, from whence the leſſer Branches ſpring, derives its Original from the left Ventricle of the Heart, as from its local Principle, but not as its material Beginning, or Principle of Generation, for that as *Hippocrates* ſays, no Part ariſes from another.

The Subſtance.

V. ***The Subſtance of the Arteries is Membranous***, for the more eaſie Contraction and Dilatation. They alſo conſiſt of a double proper Tunicle, the one external, the other internal. Which leaſt they ſhould be pain'd with continual Pulſation, are endued but with an ordinary Sence of Feeling, and are therefore vulgarly thought to be quite void of Sence.

The outer Tunicle.

VI. ***The outward Tunicle is thin and ſoft, endowed with many ſtreight, and ſome few oblique Figures***; which ſeems to be derived from the Exterior Tunicle of the Heart, and to be continuous with it.

The inner Tunicle.

VII. ***The Innermoſt, harder and much thicker***, to conveigh the Spirituous and vaporous Blood with more Security; which thickneſs and hardneſs is more conſpicuous in the great Arteries next the Heart, which firſt receive the boiling Blood from the Heart, both Thickneſs and Hardneſs abating, the farther off they recede from the Heart, and as the Blood by the way relaxes of its Heat and Subtilty, ſo that toward the Ends it is very thin and ſoft; very little differing from the Subſtance of the Veins, only in the Whiteneſs of their Colour.

Fibres.

VIII. ***Vulgarly this Tunicle is ſaid to have many tranſverſe Fibres, few oblique.*** But *Rolfinch* denies any Fibres proper to the Arteries. But the contrary appears in the great Arteries being boil'd, where the Fibres are manifeſtly to be diſcern'd. Beſides that, unleſs the Arteries were ſtrengthened by tranſverſe Fibres, they would be two much dilated by violent Pulſation, and would ſo remain, as being deſtitute of contracting Fibres, which is the reaſon of the

Tumor

Tumor called *Aneuriſma*, for that this Tunicle being burſt, together with its Fibres, the Blood ſlips into the firſt ſoft Tunicle, and preſently ſwells it up.

The third Tunicle. IX. *The inner Tunicle, as* Galen *obſerves, is overcaſt with a very thin little Skin within ſide, like a broad Cobweb, which may be ſaid to be a third proper Tunicle.* *Riolanus* writes, that he never could find it; but for all that it is ſufficiently conſpicuous in the greater Arteries, and therefore probable to be in the leſſer, and appears continuous with the Tunicle enfolding the inner Ventricles of the Heart, when it is manifeſt, that the Arteries borrow this inner Tunicle, as well as the outermoſt, from the Heart, as the Nerves borrow two Tunicles from the Brain.

The fourth Tunicle. X. *Beſides the foreſaid Tunicles, a certain improper or common Tunicle enfolds the* Aorta *with its Branches lying hid in the Trunk of the Body*; in the Breaſt, proceeding from the *Pleura*, in the lower Belly, from the *Peritonæum*, by means of which it feels more ſenſibly, and is faſtned to the neighbouring Parts; but this Tunicle it puts off when it enters the fleſhy Parts of the Bowels. And ſo in other Parts, the Arteries which do not enter the Muſcles, borrow an outer Tunicle from the neighbouring Membranes. For the Subſtance of the Arteries ought to be very ſtrong, for fear of being burſt by the violent Impulſe of the ſpirituous Blood, and to enable them to endure the ſtrongeſt Pulſations without prejudice.

The breeding of an Aneuriſma. XI. We lately made mention of a preternatural Tumor in the Arteries, called *Aneuriſma*, which happens when the ſecond harder Tunicle of the Arterie comes to be burſt by any Accident with its Fibres, by which means, the Blood flowing upon the ſoft external Tunicle, dilates it, and gathered together therein, as in a little Bag, cauſes a Swelling, wherein there is many times a very painful Pulſation and Reciprocation of Dilation and Contraction; which Tumor, if it be burſt or opened by an unskilful Chyrurgion, the Patient preſently dies of a violent Bleeding not to be ſtopt. *Regius* oppoſing this Opinion of the beſt and moſt famous Chyrurgions, attributes the Cauſe of an *Aneuriſma*, to the flowing of the Blood into the Muſcles, out of an Artery burſt or wounded; which Blood wraps it ſelf about with a little Pellicle, generated out of its own more viſcous Particles. Led into this Opinion by *James de Back*, a Phyſitian of *Rotterdam*, who told him the Accident of a Man wounded in the Arm, to the Dammage of an Artery; in which Arm, being open, a great quantity of Arterious Blood was found among the Muſcles, wrapt about with a Pellicle. Upon this, *Regius* arrogantly grounds his Opinion, and makes it his own; not conſidering, that the Blood contained in an *Aneuriſma*, is never corrupted, nor ever apoſtemates, nor engenders Inflammations, and that extravaſated Blood never generate inveſting Membranes, but preſently putrifies: and laſtly, that in ſuch a Tumor, cauſed by extravaſated Blood, there is never any remarkable Pulſation perceived, as is continually to be felt in an *Aneuriſma*. *Regius* writes farther, that in that ſame Wound of his Patient, almoſt brought to a *Cicatrice*, there appeared a Tumor that beat very much about the place affected, and which encreaſed more and more every day; but this which is related of *Back*'s Patient and not his, has not one word of Truth. For neither was the Wound cicatrized before my coming, which was within eight or ten Hours after the Man was wounded, neither was there any Pulſation to be perceived in the Arm, very much ſwell'd by reaſon of the extravaſated Blood poured forth among the Muſcles; neither was there any Pellicle to be found afterwards upon Inciſion.

The Subſtance. XII. *As to the Subſtance of the Arteries, there is a great Duſpute, whether it be nervous or griſtly.* *Ariſtotle* aſſerts the *Aorta* to be nervous, and calls it in many places νευρώδης φλὲψ, the *Nervous Vein*. Others believe it rather of a griſtly Nature, by reaſon of the Heat and Hardneſs of the Arteries; of which Opinion, *Galen* ſeems to be. But *Fallopius* believes them to be of a middle Nature, between Nervous and griſtly, but moſt griſtly, and hence it has been obſerved, that the Arteries near the Heart have been obſerved to be ſometimes griſtly and bony in old Beaſts of the larger Sort, as alſo in Man himſelf. Of which *Gemma*, *Solenander*, *Riolanus*, *Harvey* and others, produce ſeveral Examples. But Reaſon evinces the Miſtake of theſe three Opinions. For that the Subſtance of the Arteries is not nervous, their moſt obtuſe Sence evinces, whereas all nervous Parts feel moſt exactly. Nor griſtly, becauſe of its Fibres,

Fibres, which Griſtles and griſtly Parts want: Laſtly, not of a middle Nature for the ſame Reaſons. It remains then that the Subſtance of the Arteries is membranous, proper, and of a Nature peculiar to its ſelf.

Their Nuriment. XIII. *The Arteries are nouriſhed by the Spirituous Blood paſſing through them,* wherein, becauſe there are many ſalt, volatil and diſſolv'd Particles, a good part of which grows to its Tunicles, hence their Subſtance becomes more firm and thick.

The Bigneſs. XIV. *The Bulk of the Arteries varies very much.* The bigneſs and thickneſs of the *Aorta* is very remarkable, but the Part of it aſcending from the Heart, is leſs; the other deſcending larger, by reaſon of the greater Bulk and number of the lower Parts to be nouriſhed. The reſt vary in bigneſs, according to their Uſe, as they are required to ſtretch themſelves ſhorter or longer, as they are required to ſupply the Arteries derived from them with more or leſs Blood, and the farther they are from the Heart, the narrower they are, and of a thinner and ſofter Subſtance. For that the Blood, the more remote it is from the Heart, looſes much of its Spirituoſity, and conſequently leſs ſalt Particles grow to the Tunicles, there not being ſo much ſtrength required in theſe remote Veſſels, as in thoſe which are nearer the Heart, in regard the leſs ſpirituous Blood may be contained in weaker Veſſels.

Their Number. XV. *Some aſſert the Number of the Arteries to be leſs than that of the Veins;* which however cannot be certainly determined, ſeeing that the little Arteries are much more white and pellucid, and conſequently leſs diſcernable. Others make the Number equal, others, that of the Arteries more, in regard there is a greater quantity of Blood thruſt forth through the Arteries, for the Nouriſhment of the Parts then is carried back through the Veins, ſeeing that a good Part of it is conſum'd in Nouriſhment, and no leſs diſſipated through the Pores before it comes to the Veins. But then you'l ſay, how comes a greater quantity of Blood to be contained in the Veins then in the Arteries, and a more conſpicuous Swelling of the Veins, by reaſon of the Blood? The reaſon is, becauſe the Motion of the Blood is more rapid through the Arteries than through the Veins; for there paſſes more through the Arteries in the ſpace of one moment, then through the Veins in ten, by reaſon of the greater force by which the Blood is expelled by the Heart into the Arteries; whereas the motion of the Blood is remiſs and weak in the Veins, and conſequently there is more Blood ſtays in the Veins than in the Arteries.

Situation. XVI. *The Arteries lye hid in moſt places under the Veins,* partly for ſecurities ſake, partly to ſtir the Blood reſiding in the Veins forward, by their Neighbouring Pulſation. Sometimes they ſeparate from the Veins, but rarely croſs over them; only in the lower Belly about the *Os Sacrum,* where the great Artery ſurmounts the hollow Vein.

The differences. XVII. *The Arteries differ,* either in reſpect of their Magnitude, ſome being very large, as the *Aorta* and the *Pulmonary*; ſome indifferent, as the *Carotides*, *Emulgent*, and *Iliac*; others leſſer, as thoſe that creep through the Joynts and Head; others leaſt of all, as the *Capellaries* diſpierced through the whole Habit of the Body, and the ſubſtance of the Bowels. In reſpect of their *Progreſſion*, ſome ſtreight, others winding like Vine-twigs: In reſpect of their Situation in the Breaſt, in the Head, in the lower Belly, in the Joynts; others in the Superficies, others deeper in the Body. In reſpect to their Connexion; ſome to the Veins, others to the Nerves; ſome to the Membranes, ſome to other Parts.

Their Progreſſion. XVIII. *The Arteries run along through all parts of the Body,* there being no part to which Arterious Blood is not conveighed for Nouriſhment. Yet *Ent* and *Gliſſon* ſeem to affirm, that all the Parts of the Body are not nouriſhed with Blood. But this difficulty is eaſily reſolved by diſtinguiſhing between thoſe Parts that are immediately nouriſhed with the Blood, as the Fleſh of the Muſcles, the *Parenchym's* of the Heart, Liver and Kidneys; others mediately, as when another ſort of Juice is firſt made out of the Blood for the Nouriſhment of ſome Parts. As when for the Nouriſhment of the Nerves, not only arterious Blood is required, but alſo there is a neceſſity that a good part of it be firſt turned into Animal Spirits, for the Nouriſhment of the Bones, the Arteries are extended to their inner Parts, and powr forth Blood into their Concavities and Poroſities, for the generating of Marrow; alſo, that the Arteries themſelves and

Veins

Veins may be nouriſh'd with the Blood which paſſes through them: the one with the ſaltiſh Particles of the Blood and neareſt to fixation, which renders their ſubſtance thicker and more ſolid: the other with the Sulphury and more humid Particles, whence the ſubſtance becomes more moiſt and languid. The manner of nouriſhment *Fernelius* thus deſcribes. *The Veins and Arteries* ſays he, *are nouriſh'd much after the the ſame manner, which though they contain in themſelves, the Blood which is the next cauſe of their nouriſhment, yet cannot in a moment alter it into their own Subſtance. But the Portion which lyes next the Tunicles, and being firſt alter'd grows whitiſh, like dew, is hurry'd away into the little holes or Pores of the Veins and Arteries, to which when once oppos'd and made thicker, it is firſt faſten'd, and then aſſimilated.*

The Pulſe. XIX. *The Blood is carry'd to the ſeveral Parts by the means of the beating of the Heart*, which at every ſtroak contracting it ſelf, and ſqueezing the Blood into the Arteries, cauſes the Arteries at the ſame time to be dilated and to beat: for as the Heart beats when it contracts it ſelf and expels the Blood, ſo on the contrary the Arteries beat, when they receive the Blood, and are fill'd and dilated by it.

Whether a Pulſific faculty in the Arteries? XIX. *The reaſon of this many with* Praxagorus *and* Galen *aſſert to be a Pulſific and proper faculty, which cauſes all the Arteries to be diſtended and beat at the ſame time that the Heart is contracted.* To confirm which *Plater* aſſerts, the Arteries tobe form'd and beat, before the Heart. *The Arteries*, ſays he, *are form'd and beat, and carry Spirits, before the Heart perceives any motion*, which is a miſtaken Opinion. For firſt, upon all alterations of the Pulſe of the Heart, preſently the Pulſe of the Arteries is changed, whether weak, ſtrong, ſwift, ſlow, or interrupted, *&c.* which would not happen if the Arteries had a proper Pulſific faculty. *Secondly*, Let an Artery be bound in a living Creature, at the very ſame moment the Motion ſhall ceaſe beyond the Ligature; which certainly would remain a ſmall while, if the faculty of moving were innate. But you'l ſay, that the Tunicle of the Artery being compreſs'd by the Ligature the Irradiation of the Heart, which ſhould excite the Motive faculty to act, cannot paſs beyond the Ligature. In oppoſition to which I ſhall make uſe of the Experiment of *Plembius*. In a living Animal, compreſs with your Finger the *Aorta*, or any other bigger Artery near the Heart, and below the preſſure make an Inciſion, and thruſt a little Cotton into the hole, only to a ſlight obſtruction of the Artery, then take off your Finger from above the Inciſion, and then it will appear, that the Artery below the Cotton will not move at all, though the Tunicles be neither compreſſed nor bound. As to *Platerus*'s opinion we have already anſwer'd it, *l.* 1. *cap.* 23.

The cauſe of the Pulſe in the Arteries. XX. *Therefore the Cauſe of the Pulſation of the Arteries is only repletion, and the violent impulſe of the Blood into them from the Heart.* Which *Walæus*, *Bartholin* and others think impoſſible, becauſe the Blood fills the Arteries ſucceſſively, and one Part is mov'd after the other, and therefore they believe one Artery beats after another and not altogether. Not conſidering that the Arterious blood is rarify'd, hot, thin and eaſily mov'd, and that it is forc'd into the Arteries full of the ſame Blood before; ſo that upon the forcing of never ſo little into the great Artery from the Heart, the whole is forc'd forward into all the reſt of the Arteries, and ſo all the Arteries muſt of neceſſity be diſtended at the ſame time. Thus if you lay a Circle of contiguous Balls upon a Pewter-plate, and thruſt forward but one, that moves firſt, then the ſecond, then the third, and ſo all move at the ſame time. And thus it is in the Areries, where one part of the Blood being mov'd, all the reſt of the Parts of it muſt of neceſſity give way, by reaſon of its contiguity. Indeed the Heart might fill and cauſe the Heart to beat ſucceſſvely, were they empty, but not in Arteries full before. Theſe reaſons Experience confirms, which teaches us, that ſo ſoon as the Heart ceaſes to force Blood into the great Artery preſently the Pulſe of all the Arteries ceaſes. Thus at *Nimmeghen* I ſaw a Man in a Duel thruſt through the left Ventricle of the Heart, as afterward it appear'd upon opening the Body: Preſently the wounded Perſon fell down like a Man Thunder-ſtrook and dy'd: ſo ſoon as he fell, I made up to him and ſought for his Pulſe in his Wriſt and Temples, but could not perceive the leaſt motion; becauſe the Blood flowing

flowing through the Wound into the cavity of the Breaſt, could not be forc'd into the *Aorta*, which rendred the Blood of all the reſt of the Arteries immoveable without the leaſt Pulſation. The like I ſaw at *Leyden* and *Utrecht*. Alſo in ſuch as dye of a *Syncope*, when the motion of the Heart ceaſes, the Pulſe of the Arteries fails, or at leaſt as the Pulſe of the Heart grows weaker and weaker, ſo does the Pulſe of the Arteries anſwerably. Therefore all Phyſitians agree, that the beating of the Arteries is the moſt certain Indication of the Conſtitution of the Heart. But if the Arteries had an innate Pulſific Faculty, the Pulſe would indicate the Conſtitution of the Arteries, and ſo all the Phyſitians had been in an Error from *Hippocrates* till this time: therefore we muſt conclude that the Motion of the Arteries proceeds only from the Motion of the Heart. Which motion is ſomewhat help'd in the depreſſion of the Arteries, by their tranſverſe Fibres. Tho' thoſe Fibres are not mov'd of themſelves, unleſs there be a diſtention firſt by the Blood expell'd from the Heart; for they only contract to their firſt Eſtate, the Arteries diſtended beyond their uſual reſt, wherein they remain till again diſtended.

Some put the Queſtion, whether the Heart beating all the Arteries beat to their utmoſt Extremities, I anſwer, That if the Pulſes of the Heart be very violent, then it is ſenſibly perceiv'd; but if weak and languid the Motion is not ſo ſenſibly perceiv'd in their Extremities. Hence ſays *Harvey*, not without good Reaſon, *The Impulſe of the Heart diminiſhes by Parts according to the ſeveral diviſions of the Arteries; ſo that in their Extream diviſions the Arteries becoming plainly Capillary, are like the Veins not only in their Conſtitution and Tunicles, but alſo in their reſt; while no ſenſible Pulſe or none at all is performed by them, unleſs the Heart beat violently, or the Heart be over dilated.* And this is the Reaſon why at the Fingers ends we ſometimes feel a Pulſe and ſometimes none; and why *Harvey* knew thoſe Children in a Fever, if the Pulſe ſenſibly beat at the Tops of their Fingers.

Of the Motion of the Arteries, Read the Epiſtle of *Deſcartes* to the *Lovain* Phyſitian. *Tom.* 1. *Epiſt.* 78.

CHAP. II.

Of the great Artery, or Trunk of the Aorta.

THE *great Artery* from whence all the Arteries of the Body, except the *Rough*, and *Pulmonary*, proceed, very much exceeds all the reſt of the Arteries in thickneſs and length of Courſe. Nevertheleſs in ſubſtance and largeneſs it is not much different from the great Pulmonary Artery, extended from the right Ventricle of the Heart into the Lungs, which is vulgarly though erroneouſly call'd the right Arterious Vein.

I. *Now it is requiſite that the* Aorta *ſhould have ſuch a ſolid Subſtance*, leaſt the hot and ſpiritous Blood, forc'd into it from the very Furnace it ſelf, ſhould be diſſipated; and largeneſs is moreover required, to the end it may contain a ſufficient quantity of Blood to be diſtributed to all the other Arteries proceeding from it. *The Subſtance.*

II. *The Oriſice of the Heart being laid open, it adheres continuous to the left Ventricle*; at it's very riſe being furniſh'd with three remarkable Valves, faſhion'd like a *Sigma* prominent from the Heart toward the outward Parts, and hindring the return of the Blood from the Artery into the Ventricle of the Heart. *It's riſe.*

Before it iſſues forth from the *Pericardium* it emits from it's ſelf the *Coronary Artery*, ſometimes ſingle, ſometimes double, encircling the Baſis of the Heart like a Crown, and thence ſcattering branches the whole length of it, accompany'd with the *Coronary* Veins, with which ſome affirm it to be united by Anatomiſts, which however would be a very difficult thing to demonſtrate.

Near the Oriſice of this *Coronary* Artery ſtands a Valve, ſo order'd, that the Blood may eaſily flow back out of the great Artery into the *Coronary*.

This will not admit a ſlender Bodkin thruſt into it, from the Part nexr the Heart into the great Artery; but from the Part next the great Artery a Bodkin will eaſily enter the *Coronary*; by which means we find where the Valve

is, which otherwiſe is hardly diſcernible.

The *Aorta* having left the *Piricardium*, conſtitutes a Trunk, the ſmaller Part of which aſcends upward, the larger Part ſlides down toward the lower Parts.

CHAP. III.

Of the Branches proceeding from the Subclavial Arteries.

THE leſſer aſcending Part of the *Aorta*, ſpread between the inner ſeparating Membranes of the hollow Vein, reſts upon the *Aſpera Arteria*.

The Subclavial branches.

I. *Riſing from the Heart, it is preſently divided into two* Subclavial *Branches*; the right being the higher and the larger, which proceeds from the ſame place where the *Aorta* is ſlit into the *Carotides*: the left more low and narrow, which riſes where the *Aorta* winds downward, and with a more oblique Channel then the other is carry'd to the Arm.

From both theſe Branches ſeveral Subclavials proceed; ſome before it falls into the concavity of the Breaſt; others, after it has left the Breaſt.

The upper Intercoſtal.

II. *While both the Subclavials lye hid in the Breaſt, it ſends forth from the lower Part the upper Intercoſtal*, which being faſten'd on each ſide to the Roots of the Ribs, communicates ſeveral branches to three or four ſpaces of the upper Ribs of its own ſide, from which other little branches are imparted to the adjoyning Muſcles and the Pith of the Back. However ſometimes theſe Intercoſtals are derived from the Cervical Arteries, paſſing thence through the holes of the Vertebers.

From the upper Part of both the Subclavials proceed theſe three Arteries.

The Mammary Artery.

III. 1. *The Mammary, which deſcends through the Muſcles poſſeſſing the Spaces of the Griſtles of the true Ribs, and proceeding to the ſide of the Mucronated Griſtle*, is divided into ſeveral branches under the ſtreight Muſcles of the *Abdomen*, which till of late moſt *Anatomiſts* would have to be united at their ends by *Anaſtomoſis*, with the aſcending Extremities of the branches of the *Epigaſtric* Artery. But I could never obſerve that conjunction, nor does it ſtand with Reaſon, ſeeing that the Arterious Blood redundant in the Artery, cannot be transfus'd into another Artery annex'd to its ending; for the Blood is forc'd from the Heart through both the Arteries to the end, and therefore can neither be receiv'd nor carry'd to the Heart by the end of either Artery. So that if there were any *Anaſtomoſis* under the ſaid Muſcles, it ought to be of the *Mammary* Artery with the *Epigaſtic* Veins, and the *Epigaſtic* Artery with the *Mammary* Veins. Which conjunction however I could never obſerve.

The Cervical.

IV. 2. *The* Cervical, *which contributing little branches to the Vertebers and Muſcles of the Neck, paſſes to the ſeventh Verteber of the Neck*, through the holes of the tranverſe Apophyſes, and under the Pith uniting with the branch of the oppoſite ſide, is ſhatter'd into an Infinite number of diminutive branches, which running along with the little branches of the Cervical of the oppoſite ſide, intermix'd and in ſeveral places as it were ingrafted into one another from the wonderful Net-like-fold in the thin *Meninx* belonging to the *Cerebel*. Which little branches partly creep through the ſubſtance of the *Cerebel* inviſibly; partly gaping toward the inner Parts of it, pour forth a great quantity of the moſt pure and ſubtil Blood into the pores of the *Cerebel*; the little drops of which are ſeen to weep out of the diſſected ſubſtance. Moreover little branches run out toward the *Horſes Saddle*, which are intermix'd with the innumerable branches of the *Carotides*, at the lower Part of the Wonderful Net, and ſo ſeem to contribute toward the compleating of the Net, though the cheifeſt Part of it be made by the *Carotides*.

The Muſcula.

V. 3. *The Muſcula, which imparts little branches to the Muſcles reſting upon the Neck*, and ſometimes to the Muſcles of the Arm.

The Axillary and Humerary.

VI. *When the Subclavial has forſaken the Breaſt it changes it's name for that of Axillaris*, becauſe it runs to the Arm-hole, and before it deſcends to the Arm, ſends forth from its upper Part the *Humerary* Artery to the Muſcles covering the Shoulder and the Gibbous Part of the *Scapula*.

From

From the lower Part it casts forth three Arteries.

The upper Pectoral. VII. 1. *The* Upper Pectoral, which runs forth with several little branches to the Muscles spread under the Breast.

The lower Pectoral. VIII. 2. *The* Lower Pectoral, which runs downward by the side of the Breast, but is chiefly carry'd through the broad Muscle.

The Scapulary. IX. 3. *The* Scapulary, which enters the Muscles possessing the Concavity of the *Scapula*.

The Arteries of the Arm and Hand. X. These branches sent forth, the rest of the Axillary Artery, after it hath communicated the little branches to the Kernels, seated under the Arm-holes, goes away to the Arm, call'd therefore by some the *Brachial* Artery, through the inner Part of which descending between the Muscles, together with the Basilic Vein, distributes on both sides slender little branches to the Muscles embracing the inner Seat of the Shoulder: There rising outward with a deep branch of the Basilic Vein, it runs to the outer Parts of the Elbow, and affords branches to the Joynt and Neighbouring Parts, but then descending inward, under the bending of the Elbow, is divided into two remarkable Branches, of which the uppermost carrying along the *Radius*, goes to the Wrist, where the Physitians feel the Pulse, and thence proceeding under the Annulary Ligament, sends forth the following branches.

1. Between the Bone of the Thumb, and *Metacarpus* to the Muscles of the outer Part of the Hand. Nor has the outer part of the Hand any other Arteries but these discernible.

2. A double branch, to the inner Parts of the Thumb.

3. A double branch to the inner seat of the Fore-finger.

4. One to the Middle-finger.

The lower branch runs along the lower Arm to the Wrist, from whence the following branches proceed.

1. To the Muscles seated next the Little-finger.

2. To the Middle-finger.

3. A double branch to the Middle-finger.

4. A double branch to the Little-finger.

CHAP. IV.

Of the Carotides *and their Branches.*

The Carotid Arteries I. *THE Subclavials being sent forth, presently the* Carotides *start out from the ascending* Aorta; of which the left arises from its upper Trunck, then proceeds from the beginning of the right Subclavial, surmounting the *Clavicula*; though many by mistake will have it to rise from the same Trunck with the former.

These two *Corotides*, near the upper Part of the *Sternon*, being supported with the *Thymis* Glandule about the beginning, take their course upward, and with their External and Internal branch ascend to the Head. For after they have distributed branches to the *Larynx*, Tongue, the *Hyoides* Muscles, and the neighbouring Glandules, they ascend on both sides along the *Aspera Artera*, together with the Jugular Vein to the Chaps, and there are parted into the inner and outer branches.

The outer branch of the Carotid. II. *The outer Branch, which is the slenderest is dispeirs'd with a vast number of scarce discernible sprigs* through the Face and Cheeks, and waters the Forehead and *Pericranium*; partly crawling to the Ears, sends forth the following Branches.

1. One branch forward toward the Temples, which is perceiv'd in that place by the Pulse, and sometimes is open'd, in obdurate pains of the Head.

2. A Branch to the hinder place of Ear.

3. A Branch to the lower Jaw; the small boughs of which are inserted into the lower Lip; and entring the Bone of the lower Jaw, run with a little branch to the Roots of all the Teeth. From this branch, little small Twigs penetrate the external Table of the *Cranium* through diminitive holes, and enter the *Deploids*, to which they convey Blood for the making the Medullary juice.

The innermost branch. The innermost branch which is the larger, is carry'd first to the Chaps, where it affords branches to the *Larynx*, the *Paristhmii* and the Tongue, and sends little branches to the Kernels behind

behind the Ears, and the ſpungy Parts of the Palate and Noſe. Then it enters the upper Jaw, and affords a little Branch to every Tooth, through which when ſharp Humors deſcend, they cauſe the Tooth-ach; with the remaining Part aſcending the Skull, toward the bottom of it, it is divided into two Branches of an unequal bigneſs.

One of theſe, which is the leſſer, and the hindermoſt, affords a little Branch to the inner Muſcle of the Neck, and having ſent another through the Hole of the upper Verteber into the hard Meninx, involving the Pith of the Spine, aſcending farther, it enters the Cranium through the Hole in the *Vagous Nerve*, and creeps through the hard *Meninx*, and about the Hollow of the thick *Meninx*, into which it ſeems to open it ſelf with ſlender little Branches, the end of it vaniſhes.

The Rete Mirabile. IV. The other, which is bigger and almoſt equal to the Trunk, tending upward, through the bony Channel in the Wedg like-bone, near the Fore-ſide of the auditory Paſſage, is carried with a winding Courſe to the Mares Saddle. At the bottom of which, after it has ſent a Branch on both ſides into the ſide of the *thick Meninx*, expands it ſelf into ſeveral minute *Tendons*, which inſerted into the little Branches of the *Cervical* Artery, form the *Wonderful Net*, conſpicuous in Calves, Cows and Sheep, but more obſcure in Men, unleſs upon the Diſſection of a Body but newly deceaſed.

V. Nevertheleſs, the ſaid Branch does not terminate in thoſe Tendrils, but making way through the hard Meninx, enters the thin Meninx with two remarkable Branches, which intermix infinite little Strings, with the little Branches of the Cervical Artery faſtned to the Marrow; and alſo without the Skull, accompany the Spinal Pith to the Loyns. This done, it ſends another leſſer Branch through the ſecond Hole of the Wedg-like-bone, together with the Optic Nerve without ſide the Skull to the Eye. Alſo it ſtretches out another Branch through a torn Hole, not far from the *Infundibilum*, which is ſlit into two Stocks at the ſide of the Spittle Kernel; the innermoſt of which being united with the inner Artery of the oppoſite ſide, and ſhivered into diminutive Arteries, is ſcattered all over a thin Membrane, at the beginning of the Optic Nerves, and partly with innumerable viſible Tendrils paſſes through the Bulk of the Brain, partly diſcharges the Spirituous Blood through the gaping Orifices into the Pores of the Subſtance of the Brain. The other more outward, more reflex and wrapt about with a thin Membrane, and united to its own little Branches, with the diminutive Arteries carried from the Cervical to that Seat, is partly diſſeminated through the thin *Meninx*, partly aſcends upward to the foremoſt Ventricles of the Brain, wherein it conſtitutes the *Choroide Fold*.

The Plexus choroides. From the ſame larger Branch of the Carotis, another Artery proceeds, which after it has paſſed the Skull through the ſecond Hole of the *Temple*, is preſently parted into two Stocks, of which the Exterior runs through the eight Hole of the Wedg-like-bone, into the larger Concavity, winding a little Branch to the Extremity of the Noſe. The innermoſt, which is bipartited at firſt, ſends a ſlender Branch to the thick *Meninx*.

CHAP. V.

Of the Arteries proceeding from the deſcending Trunk of the Aorta, *before it comes to be divided.*

THE deſcending Part of the Trunk of the *Aorta*, which is larger at the upper Part, adheres to the Gullet. Hence ſome vainly believe, that a Man overheated with violent Exerciſe, or the Rays of the Sun, perceives ſuch a remarkable Refrigeration from a large drought of cold Water; the Gullet being thereby cold, and by that means the Blood being alſo cold that is contain'd in the Trunk of the great contiguous Artery; and that ſome in the ſame caſes ſound away, upon drinking cold Water too freely, becauſe, as they ſay, that which is contain'd in the adjoyning great Artery, being too ſuddenly cool'd by the cold Water paſſing through the Gullet, is ſomewhat thickned, and the Motion of it thereby interrupted.

The lower Intercoſtals. I. *This deſcending Part of the Trunk, before it paſſes the Diaphragma, ſends forth the lower Intercoſtals*, which are ſent from the hinder Seat

Seat of it on both ſides, to eight or nine Intervals of the lower Ribs, and communicate little Tendrils to the Muſcles of the Back and Breaſt, through the Holes in the Nerves.

The Phrenic. II. *Moreover, about the Diaphragma, from the Trunk comes forth the Phrenic,* from hence the Right, from thence the Left, which is carried to the Diaphragma, the Mediaſtinum, and ſometimes to the Pericardium.

The Remainder of the Trunk of the *Aorta* penetrating the Diaphragma, ſcatters Branches every way through the lower Parts of the Body. Some before it is parted into the Iliac Arteries, others after it is divided from them.

The Branches which proceed from it before diviſion, ſome accompany the *Vena Porta*, others the Branches of the hollow Vein.

The Branches that accompany the *Vena Porta*, are two, the *Cœliac* and *Meſenteric*.

The Cœliac. III. *The* Cœliac, *which ſome alſo call the* Stomachic, proceeds from the Body of the *Aorta* before, at the firſt Verteber of the Loyns, and deſcending under the Hollow of the Liver, is divided above the Trunk of the *Vena Porta* into two Branches, which adhere to the Sweet-bread under the hinder Seat of the Stomac.

The right Gaſtric. IV. Of theſe, that on the Right-hand, and the more ſlender, produces the *Dexter Gaſtric*, which approaches the *Pylorus*, and by *Spigelius* is called the *Pylorie*; alſo the *double Cyſtic's*, being very ſmall, diſpeirſed through the Gall-bladder with ſeveral Branches. But in the lower Part, theſe three following, have their Original, and proceed.

The Right Epiploïs. V. 1. *The Right-hand* Epiploïs, to the Right-hand Seat of the lower Caul, and the Colon annexed to it.

The Inteſtinal. VI. 2. *The* Inteſtinal, to the *Duodenum*, and beginning of the *Jejunum*.

The Right Gaſtro Epiploïs. VII. 3. *The Right-hand* Gaſtro-Epiploïs, to the bottom and middle of the Stomach.

The Hepaticks. VIII. 4. *Two ſmall Hepatic Arteries, concerning which there is ſome diſpute.* For as *Galen* ſays, they enter the *Parenchyma* of the Liver, and ſo betake themſelves for the greateſt part into the Hollow of it. *Rolfinch* affirms, that he has obſerved them very numerous in the Convex Part. *Gliſſon* affirms, that they do not enter the Parenchyma of the Liver, but only inſinuate themſelves into the common *Capſula*, and therewith are divided into the Capillary Veſſels, and communicate ſeveral Branches to the Gall-bladder, and Bilary Pores.

The remaining Portion of this Right-hand Branch enters the Meſentery, and waters it with many Sprigs.

The Splenic. IX. *The Left-hand Branch of the* Cœliac, *which is called the* Splenic, larger than that on the Right-hand, and ſomewhat ſwollen, with a winding courſe proceeds above the Sweet-bread to the Spleen, at the upper Part ſends forth the *Larger Gaſtric*, which afterwards beſtows a little Branch upon the higher and middle Seat of the Ventricle, and throws out two ſtocks of Arteries, noted with particular Names, to the Stomach.

The Coronary Stomachic. X. 1. *The Coronary Stomachic*, which girds the upper Orifice of the Ventricle like a Crown; and affords ſeveral little Branches to the Body it ſelf of the Stomach.

The Left Gaſtric. XI. 2. *The Left-hand Gaſtric*, which is carried toward the Right-hand to the upper Parts of the Ventricle, and to the Pylorus.

Beſides theſe, there proceed alſo from the Splenic Branch, but at the lower Part.

The hinder Epiploïs. XII. 1. *The Poſtic Epiploïs*, to the lower Part of the Caul, and annexed to the Colon it ſelf.

The Left Epiploïs. XIII. 2. *The Siniſter Epiploïs*, to the Lower and Left-ſide of the Caul.

The Vas breve arteriorum, *and the left* Gaſtro-epiploïs. XIV. The remainder of the Splenic Branch approaching the Spleen, enters its *Parenchyma*, after that, a little before its entrance at the upper Part, it has ſent forth a *Short Arterious Veſſel* to the Left-ſide of the bottom of the Stomach, and the Left-hand *Gaſtro-epiploïs*, which being ſupported by the upper Part of the Caul, crawls along the Left-ſide of the bottom of the Stomach, affording little Branches to the fore and hinder Part of it, as alſo to the Caul; this Branch entring the Spleen, is diſtributed through the Subſtance of it with ſeveral Divarications.

The meſenteric Artery. XV. *The Meſenteric Artery*, which alſo accompanies the Roots of the *Vena Porta*, proceeds from the forepart of the Trunk, ſometimes ſingle, ſometimes divided into two Branches, preſently after its Exit. Of theſe, the uppermoſt, riſing below the *Cœliac*, is extended through the whole upper part of the Meſentery (where it conſtitutes the Meſaraics) as alſo into the Jejunum, Ileon,

Ileon, and part of the Colon, to the Right-hand Kidney.

The inner Hemorrhoidal. XVI. The lower, rising below the Spermatics, near the Holy-bone, enters the lower Region of the Mesentery, and is distributed with several Branches into the Left-part of the *Colon*, and the streight Gut, and lastly, descending to the *Podex*, constitutes the *Inner Hemorrhoidal Arteries.*

Through the said Branches, proceeding from the *Mesenteric*, the Arterious Blood is caried for the Nourishment of the Intestines and the Mesentery it self. Nor are they to be credited, who upon *Galens* Authority, affirm that the Mesenteric Arteries suck in the thinner part of the *Chylus*. For the Heart continually forces the Blood through the Arteries from its self to the Parts, but receives nothing through them from the Parts. Nor can the two contrary Motions of Expulsion and Reception be allowed at the same time in the Arteries. Which Mistake proceeded from hence, that *Galen* did not understand the milky Vessels, but judg'd them from their white Colour to be Arteries.

The Branches proceeding from the Trunk of the *Aorta* before its Division, which follow the Stocks of the *Vena Cava*, are several.

The Emulgent Artery. XVII. 1. *The* Emulgent Artery, *of each side one, rarely more, to each Kidney*, which begins about the Conjunction of the first and second Verteber of the Loyns. The Right a little lower, the Left a little higher, and slit into two; three or four Branches enters the Kidneys of its own side. *Rolfinch* writes, that the Extremities of this unites after many Fashions, with the Extremity of the Emulgent Vein, by Anastomose's, which is no way probable. *Vide l. 2. c. 18.*

The Spermatic. XVIII. 2. *The* Spermatics, both proceeding from contiguous beginnings, of which, the Right surmounts the Trunk of the hollow Vein; rarely the Right-hand One proceeds from the Emulgent, though the Left, in Women, has been observed so to do. Each of these uniting with the Vein of its own Side, presently after their Rise, scarce two Fingers breadth from the Emulgent, in Men, descend through the Process of the *Peritonæum* to the Testicles; in Women, so soon as they approach the Testicles, they are divided into three little Branches, of which, the first is inserted into the Testicles; the second enters the bottom of the Womb with many little Sprigs, and the third is distributed into the Tube and Ligament of the Womb.

The Lumbars. XIX. 3. *The Lumbars*, which are not only distributed to the Muscles adjoyning to the Loyns and *Peritonæum*; but in the hinder Part, where the Trunk of the great Artery rests upon the Vertebers, are carryed through the holes of the Vertebers of the Loyns to the Spinal Marrow; which some think thence ascend to the Brain, all the whole length of the Pith, together with the Veins adjoyning.

The upper Muscula. XX. 4. *The* Upper Muscula, *of each side one*, which runs out to the sides of the *Abdomen* and its Muscles.

CHAP. VI.

Of the Arteries rising from the descending Trunk of the Aorta, *after its Division within the* Peritonæum.

The Iliaca *and* Sacra Arteria. I. THE Trunk of the *Aorta*, descending when it comes to the Region of the fifth Verteber of the Loyns, ascends the hollow Vein, and is divided into two Branches called *Iliac*. Now at the Division it self comes forth the sacred Artery which passing the Holes of the *Os Sacrum* with little Sprigs, opens it self into its Marrow.

Every Branch, not far from its Biforcation, is again divided into the inner and outer Branch. From the inner *Iliac* Branch, which is the lesser, proceed three Stocks.

The inferior Muscula. II. 1. *The Inferior Muscula*, which proceeds to the Muscles called *Glutei*, constituting the Buttocs, as also to the Extremity of the Iliac Muscle, and *Psoa*. About the first beginning of this Artery, sometimes from each Trunk, a Branch runs out to the skinny Parts of the *Pubes*, *Ilion* and *Abdomen*.

The Hypogastric and external Hemorrhoidal. III. 2. *The Hypogastric*, which is large, and at the lower Seat of the *Os Sacrum*, proceeds to the Bladder, and the Neck of it, and the Muscles covering the Share-bone, and with some Root-strings, runs to the *Podex*, where it constitutes the *External Hemorrhoidals*. But in Men it is carried through the two hollow Bodies of the Yard to the Nut. In Women, it is distributed

distributed through the bottom of the Womb, and the Neck of it, with a numerous attendance of Root-strings.

The Umbilical. IV. 3. *The Umbilical Artery*, which ascending near the sides of the Bladder, and inserted into the doubling of the *Peritonæum*, proceeds to the Navel, from whence it passes forth again, while the Birth is in the Womb, and runs into the Uterine Cheeskake. But in a Man born, after the Navel-string is cut, it ceases any more the conveyance of Blood; and therefore becomes more solid and harder, and is extended like a string from both the *Iliac* Arteries to the Navel.

The remainder of the inner Branch, assuming a Scien or Graft of the External Branch is dispeirsed into the Muscle possessing the hole of the Share-bone and the Muscles adjoyning.

From the outer *Iliac* branch two sprigs go forth.

The Epigastrick. V. 1. *The Epigastric*, which winding upward without the *Peritonæum* ascends the streight Muscle of the *Abdomen* in the inner Part, and is met above the Region of the Navel by the descending *Mammary*, and with the Extremities of which it is thought to unite by Anatomists: which is a mistake: as is prov'd already, *cap.* 3. and *lib.* 1. *cap.* 5.

The Pudenda. VI. 2. *The Pudenda Arteria*, which sends forth on each side a remarkable Artery into the Sinewy or Fungous Bodies of the Yard, and in Women into the *Clitoris*. Hence it is carry'd inward along the Commissure of the Share-bone, to the Privities and Groins, and their Kernels, and is lost in the Skin of those Parts and of the Yard.

These Branches being sent forth, the *Iliacs* forsake the *Peritonæum*, and are carry'd to the Thighs, and then changing their Name, are called *Crural*.

CHAP. VII.

Of the Crural Arteries.

I. THE Crural Artery, *which is less then the true Crural*, descending towards the lower Parts of the Thigh, sends forth some branches above, and others below the Ham. *The Crural Artery.*

Above the Ham three branches issue from it.

II. 1. *The Exterior Crural Muscula*, from the Exterior Part of the Crural Trunk. *The Exterior or Crural* Muscula.

III. 2. *The inner Crural Muscula*, from the inner Part of the Trunk. *The inner.*

IV. 3. *The* Poplitea, *or Ham-Artery*, which descending through the hinder Muscles of the Thigh, runs out as far as the Ham, whence it derives its Name. *The* Poplitea.

V. *Below the Ham the* Sural *proceeds from it*, which lying hid a while under the Ham, sends forth on each side, a deep sprig to the Knee and the Muscles constituting the Calf. Thence descending toward the small of the Leg, it is divided into the *Tibiæan* Arteries. *The* Sural

VI. 1. *The Exterior Tibiæan*, which descending along the Button is consumed in the Muscles of the Leg. *The Exterior* Tibiæan.

VII. 2. *The hinder Tibiæan*, which runs to the Commissure of the Tendons of the Muscles of the Calf. *The hinder* Tibiæan.

VIII. 3. *The lowermost hinder Tibiæan*, which passes through the Membranous Ligaments of the Button joyning the Muscles of the Leg, and is distributed into the upper Parts of the Foot, and the Muscles carrying the Toes outward. *The lowermost hinder* Tibiæan.

IX. The remainder of the Crural Artery, descends directly streight between the second and third Muscle of the Toes, and proceeds between the Heel and the *Malleolus* to the lower Parts of the Foot, sending forth a little branch from the side not far from the *Malleolus*, to the Muscle of the great Toe, and the upper Parts of the Foot. What remains is divided between the Tendons *The Arteries of the Feet.*

dons of the Muſcles of the Toes into two little Branches. Of which the innermoſt affords two little ſprigs to the great Toe, to the next Toe two, and to the Middle-toe one. The outermoſt affords two little ſprigs to the Little-toe, two to the next, and one to the Middle-toe.

Note, That in the Deſcription of the Arteries all Anatomiſts mention, only thoſe which are manifeſtly conſpicuous; the reſt, as not ſo apparent or not diſcernible they omit; the Nutrition ſhews, they are in the Parts. Thus we ſee the Skin is nouriſh'd by the Arterious blood, though we can find no conſpicuous Arteries therein: and the ſame may be ſaid of other Parts.

THE

THE SEVENTH BOOK OF ANATOMY. Concerning the VEINS.

CHAP. I.

Of the Veins in General.

The Definition. I. *A Vein is an Organic similar Part, membranous, long, round, hollow, containing the less spirituous Blood, and carrying it to the Heart.*

It is call'd *Organic*, as design'd for a certain Use, which is to carry the Blood.

It is call'd *Similar*, in the same manner as the Arteries are said to be.

The Form is expressed in the words *long*, *round* and *hollow*, for that it resembles a Pipe.

The *Use* is declar'd in the last words. *Containing the less spirituous Blood*, &c. for that the Blood is the primary Humor which is carry'd through them.

I say *less Spirituous*, to distinguish it from the Arterious Blood which is much more Spirituous, and comes not to the Veins till it has lost a great Part of its spirituosity.

I say *containing*; not because such Blood is contained in the Veins only, for there is sufficient found in the substance of many Parts; but because the greatest quantity is carry'd in these Vessels, and as much as may be presery'd from Putrifaction, which otherwise being so great a quantity would be soon corrupted.

I say, carrying to the Heart; because this appears to be their primary Office. *lib. 2. cap. 8.*

But the Blood is carry'd through the Veins without pulsation; but flows only and is push'd forward as one Wave pushes forward another.

The Antients ascrib'd two other Uses to the Veins.

1. *Distribution* of the *Blood.* For they thought the Blood flow'd out of the hollow Vein into the lesser Veins which is now disprov'd by the Circulation of the Blood.

2. The *Concoction and making of the Blood.* Which was *Galens* Opinion, who affirms that the Veins were made for the generating and conveighing the Blood into all the Parts; and farther least the Nourishment should loose time, while they were busied only in conveighing

the Blood; moreover, he ſays that the Diſtempers of the Veins oft-times hinder the Generation of profitable Blood. And among the *Moderns*, *Spigelius* agrees with *Galen*. *The Veins*, ſaith he, *which boyl and concoct the Blood, and have in themſelves an innate ſanguifying Faculty.* And a little after, *If we conclude that the Brain is the Domicel of Reaſon, becauſe that being injured, we find our Underſtanding craz'd; we may juſtly call the Veins the Work-houſe of Blood, becauſe that they being injured, we find depraved and bad Blood to be generated.*

Veſalius, *Joubertus*, *Laurentius*, *Schenkius*, and others, conſent with *Galen*. However, this Operation belongs not to the Veins, but to the Heart, as being the only ſanguifying Bowel, from which, the farther the Blood departs,, ſo much the more imperfect it becomes and never is reſtored or elaborated to a better Condition in the Veins; and therefore for that very reaſon, there is a neceſſity for the Blood to be return'd again to the Heart, there to be a new concocted and wrought to perfection. Which *Highmore* conſidered, and therefore ſignally refutes this Opinion. *Vide lib.* 2. *cap.* 11, and 12.

The Subſtance.

II. *The Vein is of a Membranous Subſtance, indifferently ſoft, to the end it may the more eaſily be diſtended, and grow languid again.*

Its Tunicles.

III. *It conſiſts of one proper Tunicle, ſoft and dull of feeling, ſo that it is vulgarly ſaid to have no feeling at all. It is alſo thought to be interwoven with a threefold ſort of Fibres.* Concerning which, there is a great Diſpute among the Anatomiſts. *Fallopius* and *Veſalius* very much queſtion, whether there be any or no? becauſe with all their Induſtry they could never obſerve any. *Scaliger* alſo denies them ſtrenuouſly. On the other ſide *Briſſot* and *Fernelius* admits Fibres in the Veins; telling us, that the Fibres of the Veins are to be obſerved in letting blood, with whom *Fuchſius* and *Dunius* agree. To give our own Judgment in this caſe, we think, that though no Anatomiſt can manifeſtly demonſtrate Fibres in the Veins, yet that they are eaſily to be imagined by any one that conſiders their neceſſary Uſe, which is to preſerve the Veins in their due State, and to bring them to their Natural Condition, after being diſtended with too great a quantity of Blood, by Contraction. Which is manifeſtly apparent in Warts, when the tranſverſe and oblique Fibres being burſt, the Tunicle of the Veins is very much relaxed, nor can ever be reduced to its firſt Eſtate. Which *Lindan* ſeems not to have conſidered, wonders that Phyſitians ſhould admit ſuch a multitude of Fibres in the Veins, when the ſtreight ones are only requiſite. Which was *Lindans* Miſtake, for if the ſtreight ones are to be admitted, much more the Tranſverſe and Oblique. *Spigelius* and *Plempius* obſerve that theſe Fibres may be demonſtrated by boyling the Trunks of remarkable Veins in large Animals. *Deuſingius* believes, that by means of theſe Fibres, the Veins attract the Blood, and carry it to the Heart; and affirms, that the Meſeraics alſo draw the *Chylus*. But theſe are meer Imaginations, contrary to Reaſon and Experience.

Senſe.

IV. *That the Tunicle of the Veins has little or no Sence of Feeling, appears* by the opening of it in Blood-letting, at what time, if there be any Pain, it proceeds from the Skin, and other adjoyning ſenſible Parts, that adhere to the Vein.

Riolanus reproves *Bauhinus*, for ſaying the Veins do not feel; citing out of *Plutarch*, that *Marius* felt an extream Pain upon the cutting his Warts; and farther, that the ſwelling of the Hemorrhoids cauſes a moſt ſharp Pain. But this Pain was felt in the Skin and adjacent Parts, not in the Vein. We have alſo ordered Warts to be cut, which have been very painful till the Vein has been freed from the Incumbent Membranes, but no longer.

The improper Coat.

V. *Beſides the foreſaid proper Tunicle, a Vein has alſo another improper and common,* with the neighbouring Parts, in the Breaſt from the *Pleura*, in the *Abdomen* from the *Peritoneum*, in other Parts from the next Membrane, the more to ſecure it, being annexed to the neighbouring Parts in the length of its Progreſs. This Tunicle it puts off, when it enters the *Perenchymas* of the Bowels, and the Subſtance of the Muſcles or other Parts.

Its Nouriſhment.

VI. *The Vein is nouriſhed with the Blood which flows through it,* with which, by reaſon few ſalt Spirits are mixed, there being nouriſhed with a moiſter Juice, the Subſtance of it becomes more ſoft. The manner of its Nouriſhment, ſee *l.* 6. *c.* 1.

Why the Veins do not beat?

VII. *Here ariſes a Queſtion, why the Veins do not beat?* ſeeing they receive

ceive the Blood from the Arteries, and carry it back to the Heart. I anſwer, that the Motion of Pulſation in the Arteries, is continued to their very Extremities. But by reaſon of their Divarications, the violence of it is diminiſhed more and more by degrees, and toward the ends is but very weak; if it does not ceaſe altogether, ſo that there can be no Pulſation in the Veins. Beſides, the Blood gently gliding out of the ſmall ends of the diminutive Arteries, and entring the narrow Orifices of the Veins, preſently flows into the broader Veins; ſo that then all violent Motion ceaſes, and conſequently all Pulſation. See the Compariſon concerning this Matter, *l.* 2. *c.* 8.

The Veins more inwardly are furniſhed with ſeveral Valves Membranous and thin, however cloſe and compact, and are ſometimes ſingle like a little Half-moon; or double, two oppoſite one to another, as is obſerved in ſome of the larger Veſſels. Sometimes threefold, triangularly oppoſed one to another. Theſe are all ſo ſituated, as to give free paſſage to the Blood flowing through them to the Heart, but preventing its Reflux from the Heart. And therefore the Valves of the Veins of the Head look downward, but the Valves of the lower Parts look upwards.

Valves. VIII. ***The Number of the Valves is infinite,*** neither can they be all diſcovered by the Anatomiſts. Yet ſome have taken an accompt of the moſt conſpicuous, which they reckon to be a hundred and eight. But that is nothing, in the leſſer Veins there are Myriads of Veins not to be diſcovered; but that they are there, is apparent, for that the Blood is ſo reſtrained by thoſe Valves, that you cannot force it back with your Finger into thoſe Parts from whence it flow'd.

The bigneſs. IX. ***The Bigneſs of the Veins is very various.*** In general, the ſoft, hot, and moſt moving Parts, have the bigeſt Veins, becauſe the moſt Blood is required from them; the hard, colder, and leſs moving Parts have ſmaller Veins for the contrary reaſon. The biggeſt of all, by reaſon of its remarkable Hollowneſs, is call'd *Vena Cava*, which is, as it were, the main River of the Blood, into which, the leſſer Veins, like leſſer Streams diſcharge their Blood. The bigger ſort are by *Hippocrates* called *Blood-powrers*, becauſe that being broken or cut, they powre forth a great deal of Blood; the leſſer he calls *Capillaries*, as reſembling ſo many Hairs.

Some few Veins proceed unaccompanied, but moſt have an Attery that runs along with them; frequently jigg by jowl, rarely ſpread under it, but more frequently by reſting upon it. Many at their Extremities unite with the ends of the Arteries, by *Anaſtomaſis*, but the Capillary ends of moſt vaniſh in the ſubſtance of the Parts.

The Difference. X. ***The Veins differ,*** 1. In reſpect of their *Subſtance*, ſome having a thicker, ſome a thinner Tunicle. 2. In reſpect of the *Bigneſs*, ſome large, ſome indifferent, ſome *Capillary*. 3. In reſpect of the *Figure*; ſome ſtreight, ſome arch'd, others winding. 4. In reſpect of their *Situation*; ſome in the Head, ſome in the Breaſt, others in the *Abdomen* or Joynts. 5. Others in reſpect of their *Connexion*; ſome to the Fleſh, ſome to the Arteries, others to the Nerves, Bones, and other Parts. But in regard there is but one uſe of the Veins to carry Blood to the Heart, there can be no difference obſerved from hence.

The Number. XI. ***The Number of the Veins, ſome think to be greater than that of the Arteries, others equal,*** which is a hard thing to determine; ſeeing it is impoſſible to diſcern all the Productions, either of the Veins or Arteries. If you mean the main Trunks, then they are equal. Three main Arteries. and three primary Veins, the *Porta*, *Cava*, and *Pulmonary*. To which, if we add the *Umbilical*, then we may the umbilical Arteries to their Number. And as the latter are the Productions of the Iliac Arteries, ſo is the former the Product of the *Vena Porta*.

Their Original. XII. ***No Man queſtions but that the Veins have their material Beginning from the Seed.*** But whether they firſt proceed from the Liver or the Heart, is much diſputed. Moſt affirm that they riſe from the Heart. Hence *Epigelius*, *The Veins*, ſaith he, *are ſo intermixed with its* Parenchyma, *that hardly any Anatomiſt could be hitherto perſwaded, but that they ariſe from the Liver*. But theſe Diſputants are all out of the way, for every Part is ſaid to ſpring from another three manner of ways. Either by way of Generation, Radication, or Diſtribution. In reſpect of Generation, a Vein cannot be ſaid to ſpring from another Part, ſeeing that all the ſolid Parts, Heart, Liver and Veins, *&c.* are all formed at the beginning out of the Seed, one before another, not one by

another. Not in respect of *Radication*, seeing that a Vein has no Roots to conveigh alimentary Juice for the Nourishment of its Parts drawn from Matter forreign from the Body of Man, nor the ends of the Veins be said to be Roots, but only their beginnings, through which the Blood, which has lost its Spirituosity, and is become useless for Nourishment is conveighed back to the Heart to be new concocted and restored to its first Purity. Nor in respect of *Distribution*; seeing the Blood is not distributed to the Parts through the Veins, or by any of their Productions, but rather taken away from the Parts to be carried back to the Heart; whence it is apparent, that the Veins arise from no Part. With much more Reason they might be derived from the Substance of the Parts, from whence they seem to rise with little Roots, and grow into a Stalk, such as the *Vena Cava*, like a Tree, whose Root receives the Juice of the Earth, and conveighs it to the Trunk, as the Veins receive the Blood from the Parts themselves, and from the Arteries therein contain'd. But this is easily disproved by what has been said before, so that we must conclude the Veins to be Parts subsisting of themselves, formed with other Spermaticks out of the Seed. As to any farther Enquiry, *Hippocrates* said well, *The Veins diffused through the Body, and many springing from one, but whence that one derives its self, or where it terminates, I do not know; for the Circle being made, there is no end to be found.*

In the mean time, as the Rivolets, which are the first Receptacles of the Water flowing from Springs and Mountains, do not derive their beginning from the Channel of the River: So the small Veins cannot be said to rise from the great ones, or the Bowels thereto annexed, but are the first Springs that suck in the Blood, and carry it to the larger Vessels; otherwise than in the Nerves and Arteries, wherein there is a Progress of the Blood and Spirits from the primary Bowels to the larger Vessels, and from them to the lesser; and consequently the primary and larger Vessels are first to be described. But in the Description of the Veins, we must begin with the Capillaries, which are the least, to the end we may understand more easily, how, from whence, and whither the Blood is conveighed. Which is the reason we make use of this Method, quite contrary to what has hither been observed in the beginning, with the Springs and Fountains and smallest Roots of the Veins.

As to the Umbilical Vein, see *l.* 1. *c.* 32. Concerning the Pulmonary we have sufficiently discoursed, *l.* 2. *c.* 9. and 13. Here therefore we shall only treat of the *Porta* and *Cava*, and the lesser Rivolets that discharge themselves into them.

CHAP. II.

Of the Vena Porta, *and the Veins united to it.*

I. THE Vena Porta *enters the Hollow Part of the Liver between the two Eminences, which* Hippocrates *calls* πύλας, *or* Gates *with a broad, but short Trunk, seated under the* Duodenum. *The* Vena Porta.

II. *The beginning of this Vein, is by some derived from the Liver, by others from the Mesentery. But the Doubt is easily resolved, by saying that it takes its Rise from the Intestines and the Mesentery both.* For that from those Parts through its Roots, it receives the Blood remaining after Nourishment, and conveighs it to the Liver, being pouted forth into its Trunk through its Ramification expanded into the Liver; to the end it may be therein converted into bilous Ferment, as in *l.* 1. *c.* 14. But to prevent the Blood from slipping back from whence it came, it has many *Valves* both in the Roots and little Branches, none in the Trunk to withstand the force of the retiring Blood. *Its Rise.*

Into this *Vena Porta* several lesser Veins discharge the Blood as into a Channel, thence to be carried to the Liver, into which it is inserted in with an extraordinary Ramification. But how those little Branches are intermixed in the Liver with the Roots of the *Vena Cava*, and *Porus Bilarus*, has been already said in the forementioned place. These following Veins enter into the *Vena Porta*.

III. 1. *The Umbilical Vein*, proceeding from the Navel, and uterine Cheeskake. *The Umbilical Vein.*

IV. 2. *The Suspensory Vein*, observed by *Fallopius* and *Eustachius*, which descends from the *Septum* to the *Porta*. *The Suspensory.*

V. 3. *The*

The double Cystics. V. 3. *The double Cystics*, which are two small Veins running forth from the bilary Bladder to the left part of the *Porta*.

The right Gastric. VI. 4. *The Right-hand Gastric*, which proceeding from the hinder part of the Ventricle and *Pylorus*, from the Right-hand, enters the Trunk of the *Porta*, somewhat lower than the *Cystic*.

The Splenic Branch. VII. 5. *The Branch or Splenic Channel*, which being very large, and supported by the membranous Body of the Caul, is carried from the Spleen, transverse to the *Vena Porta*, and opens its self into its Trunk in the higher and left Part.

The Mesenteric Vein. VIII. 6. *The Mesenteric Vein*, which is larger than the former, and proceeds from the Mesentery to the lower and right Part of the *Porta*.

But because that by the means of these two larger Veins, the *Splenic* and the *Mesenteric*, the Blood of many Parts seated in the lower Belly, is carried to the *Porta*, we must enquire what lesser Veins, and whence they come to these greater.

Many Veins terminate in the Splenic Channel; some at its double beginning above and below, where it first issues out of the Spleen; others, after the beginning unite into one Channel.

Into the lower beginning these Veins open themselves.

The Splenic Veins. IX. 1. *An innumerable Number of diminutive Veins dispierſed through the Spleen*, and at length unites into one Trunk, continuous with the Splenic Branch, to which it gives its Name.

The left Epiplois. X. 2. *The Left Epiplois*, which crawls from the Interior Membrane of the Caul, with a double Sprig. Yet *Vesalius* and *Bauhinus* tells us, that this is not always to be found.

The left Gastro-Epiplois. XI. 3. *The Left Gastro-epiplois*, which is sufficiently remarkable, starting from the left Part of the bottom of the Ventricle, together with the Branches ascending from the upper Membrane of the Caul, proceeds thither.

The short veiny Vessel. XII. Into the upper beginning of the Splenic Channel, sometimes two, sometimes three, sometimes more short Branches descend from the Stomach; frequently one, which they call the *Short Veiny Vessel*, which is many times as big as a Goose-quil.

After these two beginnings are united, the Trunk of the Splenic Channel is formed, into which they descend at the upper Part.

The lesser Gastric. XIII. 1. *The lesser Gastric*, from the hinder gibbous Part of the Ventricle.

The greater. XIV. 2. *The larger Gastric*, into which, several Branches are united from the larger Part of the whole Ventricle, and the upper Part of the Orifice it self, wherein is constituted the *Stomachic Coronary*, and sometimes from the lower Part.

The right and hinder Epiplois, *and Pancreatic Veins.* XV. At the lower Part enter the *Dexter Epiplois*, which is lesser, from the lower Membrane of the Caul, and the place annexed to it; and the *Postic Epiplois*, which is the bigger; also the *Sweet-bread Vein*, from the Pancreas, carried between both the *Epiplois's*.

The Meseraic Veins. XVI. Several lesser Veins enter the Meseraic, which exceeds the Splenic Channel in bigness, and those either at its double beginning, or at the Right or Left Mesenteric, or into the Trunk of it.

In the Mesenteric, on the Right Side, meet an innumerable company of Veins, called *Mesaraic Veins*, ascending from the *Jejunum*, *Ileon*, blind Gut, and Right-hand Part of the *Colon*, supported with many Kernels interspersed, receiving the Milky Vessels, which nevertheless they do not enter. These, at first uniting into fourteen Branches for the most part terminate at length in the said Mesenteraic.

The internal Hemorrhoidal. XVII. Several Mesaraic Veins terminate also in the left Mesenteric, ascending from the left and middle Part of the Mesentery. Among which, the most remarkable is the *Inner Hemorrhoidal*, which at its beginning orbicularly embraces the Podex with slender Roots, and thence ascending under the Right Intestine, receives little Sprigs from the whole *Colon*, till it enter the Mesenteric with the rest. However, in some Bodies it has been observed that this Vein runs directly to the Splenic Branch, and opens into it.

But into the Trunk of the Mesenteric, which the Veins meeting both on the Right and Left Side, two Veins enter.

The other right Epiplois. XVIII. 1. *The other Right hand Epiplois*, rising from the bottom of the Ventricle and the upper part of the Caul, and this sometimes, but very seldom enters the Left Mesenteric, after it comes to be divided. In Dogs, this sometimes proceeds to the Intestinal, some-

ſometimes is wanting, and then the leſt ſupplys the place of both,

The Inteſtinal. XIX. 2. *The Inteſtinal* proceeding from the middle of the *Duodenum*, and the beginning of the *Jejunum*, as alſo from the upper part of the Caul and Sweat-bread.

The uſe of the Vena Porta. *The firſt Opinion.* XX. *The* Vena Porta *by the Phyſitians is aſſign'd to ſeveral Uſes.* For the Ancients aſſerted that their Veins and the Meſaraics the Blood flow'd for the Nouriſhment of the Inteſtines and other Parts contained in the *Abdomen*; that the Chylus alſo aſcends through the ſame paſſages to the Liver; moreover that the more feculent Part of the Chylus was carry'd through the Splenic Channel to the Spleen, and was there concocted into a certain acid Juice, afterwards for the ſtimulating of Hunger to be conveigh'd into the Stomach through the *Short veiny Veſſel.* But Dr. *Harvey's* diſcovery of the Circulation of the Blood has ſcatter'd all theſe Miſts of Error; So that now adays there is no man vers'd in Diſſection but will deride theſe Vanities. For in the Diſſection of a living Animal, the ſhort Veiny veſſel being ty'd, preſently by the ſwelling between the Ventricle and the Ligature, and the falling on the other ſide, it is apparent that the Blood flows from the Ventricle to the Splenic Channel, but nothing from the Spleen or Channel to the Ventricle. Alſo bind the Splenic Channel, and by the ſwelling between the Ligature and the Spleen, and the falling toward the *Porta* Vein, 'tis manifeſt that the Blood is carry'd from the Spleen to the *Porta* Trunck, but not the *Chylus* from the *Porta* Vein to the Spleen.

As to the Motion of the *Chylus* and the Blood moving upward and downward through the *Meſaraics* 'tis contrary to ſence; ſince ſuch a contrary Motion of two different humors can never be at the ſame time in thoſe Veſſels ſo extreamly narrow. Nor will the ſimilitude ſignifie any thing of ſhavings of Iron and Straw mix'd together in one Pipe, and putting a Load-ſtone at one end to draw the Iron, and a piece of Amber at the other to draw the Straw. For two dry bodies of that Nature do not unite like two moiſt bodies. Nor are there any two ſuch different Magnets belonging to the *Meſaraics*, to draw the *Chylus* upward and the Blood downward, but in the whole Body of Man a ſingle propulſion of the Blood from the Heart.

XXI. Others affirm the Blood and *Chylus* to paſs through by turns; as if there were a certain Contract between the Blood and the *Chylus*, that when the *Chylus* is coming, the Blood ſhould go back or ſtop in the Liver, and ceaſe to flow for that time to the Bowels, which is ridiculous. *The ſecond Opinion.*

XXII. Others will have the *Chylus* only aſcend to the Liver through theſe Veins, and that they have a proper faculty to die the *Chylus* of a red Color. But neither is there any ſuch faculty in the Veins, nor could the Blood remaining after Nouriſhment return to the Heart, if the *Miſaraic* Veins were only deſign'd to carry the *Chylus*. *The Third Opinion.*

Plempius, ſays, that the Arterious blood remaining after Nouriſhment flows back to the *Porta* through the *Meſaraics*, and that the *Chylus* from the Inteſtines is mix'd with it. But he ſhould have ſhew'd us which way the *Chylus* enters the Veins: which ought ſomewhere to open into the Inteſtines, to receive the *Chylus*: rather why does not the Blood which is thinner and more ſpirituous then the *Chylus* flow through thoſe Openings into the Inteſtines? Why ſhould the thicker *Chylus* enter, rather then the thinner Blood go forth? If *Plempius* plead attraction in thoſe Veins, there is no ſuch thing to be allow'd in our Bodies, as you may ſee more at large. *lib.* 1. *cap.* 12. and *lib.* 2. *cap.* 8. If he fly to the diverſity of the Pores or Mouths of the Veſſels; I anſwer that through whatever Pores the thicker *Chylus* can paſs, with more eaſe the thinner Blood may go through. Beſides that never any man could hitherto obſerve any thing ſo much as like the *Chylus* in the *Miſaraics*, which is always to be found in the Milky and other Chylifer Veſſels. *The fourth Opinion.*

XXIV. Theſe laſt Aſſertions of mine perhaps *Lewis de Bills* may oppoſe, agreeing with *Plempius*; to which end he has feigned certain Valves at the ends of the *Miſaraics* to withſtand the Exit of the Blood, but admitting the *Chylus*, in his Epiſtle to D. *Jordaen* Phyſitian at *Dort*, wherein he endeavours to prove the entrance of the *Chylus* into the *Meſaraics* by this Experiment. Diſſect the *Abdomen* of a living Dog, ſeparate the Arteries and *Meſaraic* Veins one from another, and tye ſtrings about all the Arteries, to prevent any more Blood from running into the Veins; then ſow up the *Abdo-* *The fifth Opinion.*

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men again and keep the Dog alive for three or four hours, till the Meat given him before Diſſection be turned into Chylus; then opening the *Abdomen* again, and you ſhall find the Arteries quite empty, but the Veins full of a muddy Liquor, of a dark Aſh Colour.

This Experiment the *Bilſianiſts* admire; but if we conſider the thing more narrowly, we ſhall find that neither the Colour, Conſiſtence or Quantity of the Blood contained in the Veins, can perſwade us that the *Chylus* runs through thoſe Paſſages. For the Blood contained in the Meſeraic Veins, conſidering the Part may be more feculent than that contained in other Parts. And perhaps the Blood mentioned in the Experiment might be of a bad Colour, by reaſon of the Arterious Blood, becauſe the Ligatures could not come to purifie it; but this does not prove that Feculency doth proceed from any Mixture of the *Chylus*. Now why the Blood is better and more pure at the ſame time in ſome Parts of the ſame Perſon than in other Parts, where it is more feculent and diſſolved; *Fernelius* tells us, *l.* 4. *Pathолog c.* 6. which Experience alſo confirms; for that upon opening a Vein, the firſt Blood ſhall be more feculent and diſcoloured than the laſt, and many times out of the Arm the Blood ſhall be freſh and good, and at the ſame time taken from the Foot feculent and livid, and yet no Man will believe that the Chylus comes to the Foot to change the Colour of the Blood. But this proceeds from the deprav'd conſtitution or ſpecific Temper of the Foot. Thus, by reaſon of the ſpecific Temper of the Meſentery, the Blood paſſing through it may be more feculent and diſcoloured by paſſing through a muddy Channel, then that which paſſes through the fleſhy and well tempered Parts, which Feculency vaniſhes when concocted by the Liver, it acquires a fermentaceous Quality, and comes to be again dilated by the Heart. And this is the reaſon, that in the *Vena Porta* and the Meſeraic Branches, ſometimes more thick and impure Blood is found, than in the Hollow and other Veins. I ſay ſometimes, becauſe that for the moſt part it does not differ from the Blood in other Parts, or other ſanguiferous Veſſels. We our ſelves alſo have taken Blood out of the Meſeraics of Beaſts, at the ſame time, when all the Lacteous Channels ſwell'd with milky Juice, and have compared it with the Blood of other Veins, but could find no manifeſt difference either in Colour, Subſtance or Coagulation. The ſame has alſo been obſerved by *Nicholas Stenonis*, *I obſerved*, ſaith he, Bilſius's *Method*, *bound the Arteries, kept the Dog alive, the firſt time three Hours, the next four, and then cut open his* Abdomen *again, and expoſed the Blood ſeparately taken out of the* Porta *and* Aorta *to the Air, but they coagulated with equal ſwiftneſs, gliſten'd both alike, and blackened both alike.* And therefore *Clement Niloe* frivolouſly aſſerts, that the Blood taken under the *Porta* from the *Meſeraics* coagulates otherwiſe than the Blood of other Veins; nay, that it coagulates into a glaſſie hardneſs.

Nor do I admire that *L. de Bils* found all the Meſeraics full. For what ſhould force the Blood farther out of them, when all the Arteries were bound? And therefore if you bind the Arm too hard, before you prick the Vein, by which means the Arteries are compreſſed after the Wound is made, the Blood will never come forth; for the Impulſe of the Arteries ceaſing, the Blood ceaſes to flow through the Veins.

But yet ſtill to perſwade us that the *Chylus* paſſes through the *Meſeraics*, *Lewis de Bils* tells us, that theſe Veins about the Inteſtines, exceed the Lacteous Veins in bigneſs and capaciouſneſs. Which is contrary to Sight it ſelf, the Lacteous Swelling with *Chylus* being no leſs conſpicuous about the Meſeraics, then the other Swelling with Blood: though indeed when the Lacteous Veins are empty, the Meſeraic are more apparent, becauſe of the ruddy Blood contained therein. So that this is but a weak Argument of *Bils* to prove his Aſſertion. Beſides that, that *James Henry Pauli*, Profeſſor at *Coppenhagen*, writes, that he has obſerved the milky Veſſels to be larger at their Inſertion into the Inteſtines than the *Meſeraics*; and that the milky Veſſels paſſed directly into the Tunicles of the Inteſtines, gaped toward their inner Parts, and being ſqueez'd, poured forth *Chylus*, whereas the Meſeraics being ſqueez'd, did not pour forth Blood until the inner Tunicle of the Inteſtine were ſcraped away. But though theſe things might be ſufficient, yet ſome were ſo curious to invent the following Experiment to put all things out of doubt.

doubt. They take the *Jejunum* with part of the *Ilium* and Meſentery annext to it, out of the live Animal, and tye it ſtrongly to both ends. Then before the Knot, they pour in a certain Liquor blackned with Ink, and gently ſqueezing the Inteſtine Swelling with that Liquor, they find that nothing of the black Liquor enters the Meſeraics, but that very much enters the milky Veſſels. Much more of this, ſee *l.* 1. *c.* 11, 12.

The true uſe of the Vena Porta.

XXV. *Now then the true uſe of the* Vena Porta *is threefold.*

1. To receive the Blood of the Birth included in the Womb, the ſanguinous alimentary Juice out of the Uterine Cheeſcake, through the Umbilical Vein, and deliver it to the Liver or the Hollow Vein.

2. To conveigh to the Liver and Hollow Vein the Blood which is forced to the Inteſtines and other various Bowels of the Abdomen, and remaining after Nouriſhment, and carried thither through the *Meſeraics* and other leſſer Veins.

3. To conveigh to the ſame place, the Arterious Blood concocted after a ſpecific manner, and endued with a ſubacidiſh, fermentaceous Quality.

Therefore in its Uſe, the *Vena Porta* differs very little from the *Vena Cava*, and other Productions of the *Cava*, for all the Veins of the Body return the Blood to the Heart, which the Arteries took away from it. There is indeed ſome little difference in the thickneſs of the Tunicle from the hollow Vein, and the darkneſs of the Colour; but for any difference in Subſtance, as *Bauhinus* and ſome others aſſert, 'tis a meer Notion.

CHAP. III.

Of the Hollow Vein, and the Veins united to it above the Diaphragma.

The Hollow Vein.

I. *THE Hollow Vein is the largeſt of all the Veins in the Body,* and the River into which all the other Blood-bearing Veſſels like ſo many little Streams diſcharge their Blood.

The Situation.

II. *It is ſeated all along the Spine of the Back, from the* Os Sacrum *to the* Jugulum, *and ſo is carried with a ſtreight Courſe through the middle and lower Belly, there immediately faſtned to the Heart, here to the Liver.*

Several Veins enter this Vein, ſome above and ſome below the *Diaphragma.*

Above the *Diaphragma*, theſe that follow.

The Phrenic or Diaphragmatic.

II. 1. *The* Phrenic *or* Diaphragmatic, of each ſide one, the Roots of which, adhere to the *Mediaſtinum*, *Diaphragma* and *Pericardium*; ſome write, that it has a Valve at its entrance into the Hollow Vein, preventing the ſliding back of the Blood from the Hollow Vein, which is very probable, both in this and many other Veins gaping into the Hollow Vein.

The Pneumonic.

III. 2. *The* Pneumonic, which proceeding out of the Lungs, not far from the *Phrenic*, opens it ſelf into the Trunk. This, by reaſon of its ſlenderneſs, is not eaſie to be found, but has been obſerved by *Sammichelius*, whom *Aquapendens*, *Caſtius* and *Mongius* cite.

The Coronary of the Heart.

IV. 3. *The* Coronary *of the Heart*, ſometimes double, into which many leſſer Veins aſcending from the Point to the Baſis of the Heart, and girding it like a Crown, aſſemble together. At its ingreſs into the Hollow Vein, *Euſtachius* firſt diſcovered a Valve like a little Half-moon. This, *Bauhinus* ſays, is ſo ſeated, that it hinders the flowing back of the Blood from the Heart to the Hollow Vein, wherein he is groſly miſtaken; for it is to hinder

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an Influx of the Blood out of the Hollow into the Coronary Vein.

The Azygos. V. 4. The Vein without a Pair or ἄζυγος, becauſe in Men it is ſingle, having no Fellow on the oppoſite Side. Yet *Fallopius* and *Bauhinus* have ſometimes obſerved in Men another Vein like to it on the oppoſite ſide, and inſerted into the left Branch of the Subclavial, and ſometimes into the Hollow Vein it ſelf on the left Side, about the Region of the third Verteber of the Breaſt, which ſupplies the Office of the *Azygos*, and receives the Blood ſome ſpaces diſtant from the *Intercoſtals*, and then, about the ſixth or ſeventh *Verteber* of the Breaſt united with the *Azygos*. However, this rarely happens in the Body of Man, though *Bauhinus* aſſerts it to be frequent in Goats and Hogs, and many Creatures chewing the Cud, wherein it is many times double, one on the Left, the other on the Right Side. *Riolanus* derides this ſecond Vein, or if it be found, declares it preternatural, as all things are which he diſcovers not himſelf.

In Man, the *Azygos* enters the Hollow Vein about the fourth and fifth Verteber of the Breaſt, a little above the Heart, on the hinder and right ſide, but in Sheep and many other Animals it enters it on the Left-hand.

It receives Blood from the Intercoſtal Veins, poſſeſſing the Intervals of the ten inferior Ribs, rarely of the uppermoſt; ſometimes alſo from the *Mediaſtinum*, the Vertebers, the Gullet, the Intercoſtal Muſcles, and thoſe of the *Abdomen*, and ſome other Parts from whence Branches aſcend to it. Sometimes alſo a Branch from the ſiniſter Emulgent, and ſometimes another Branch from the Trunk of the Hollow Vein above the Emulgent, aſcending upwards and paſſing the *Diaphragma*, is united above the Spine with the Roots of the *Azygos*, and then the Blood not only flows through the Trunk of the *Azygos*, but alſo through theſe Paſſages out of the Intercoſtal Spaces, and the Parts adjoyning to the Hollow Vein. By Vertue of the Communion of theſe Paſſages, *Aquapendens* aſſerted for a certain, that Snivel and purulent Matter in thoſe that are troubled with much Spitting, may be eaſily purged out of the Hollow of the Breaſt, by the Urinary Paſſages, not conſidering that ſuch an Evacuation can never paſs by theſe Ways. *Firſt*, becauſe theſe Veins in the Breaſt being enveloped with the *Pleura* Membrane, can by no means receive that Matter. *Secondly*, that they muſt of neceſſity open to receive it; but being opened, the fluid Blood may eaſily flow into the Cavity of the Breaſt, but that it would be a difficult thing for the ſlimy Flegm to flow thtough the narrow Paſſages of theſe Veins. *Thirdly*, becauſe the Valves ſtand in the way, preventing the Efflux of any Liquor out of the Breaſt to the Kidneys. For at the Root of the *Azigos*, many times three Valves are obſerved, one at its entrance into the Hollow Vein, two in the middle of the Trunk, by which the Influx of the Blood out of the Hollow Vein into the *Azygos* is prevented, but free Egreſs out of the *Azygos* into the hollow Vein is allowed. *Bauhinus* writes, that he never obſerved theſe Valves, either in Men or Beaſts. *Riolanus* avers, that he has ſhewn them in all ſorts of Carkaſſes; but both ſeem to ſpeak over abſolutely. For I have diligently ſought for them, both in publique and private, as well in Men as in Brutes, but never found them all in every one; only in ſome I have obſerved one Valve at the Entrance of the hollow Vein, in ſome none at all, ſo that there is no certain Determination to be given.

VI. 5. *The upper Intercoſtal*, of each ſide one, which oft-times however enters the Subclavial Branch, near the beginnings of the Jugular Veins. Sometimes the Right-hand Intercoſtal is inſerted into the Trunk of the Hollow Vein, the Left into the *Subclavial* Branch; but at the entrance, fortified with a Valve to hinder the Relaps of the Blood. The Roots of it riſes from three or four Intervals of the Superior Ribs, and are frequently mixed with the mammary Roots, creeping through the Griſtles. Sometimes it happens that Veins are carried from all the Spaces of the Ribs to the *Azygos*, and then this upper Intercoſtal is wanting. *The upper Intercoſtal.*

6. Two *Subclavials*, of which, in the next Chapter.

CHAP. IV.

Of the Subclavial Veins, and Veins of the Head.

TWO Subclavial Veins, *the Right and Left enter the Supream Part of the Trunk of the* Cava, and while they ſtay within the Breaſt, are called *Subclavial*; but having forſaken the Cavity of the Breaſt, are called *Axillary*.

Many leſſer Veins carry the Blood to theſe Subclavials, ſome of which, open themſelves into them at the lower Part, others at the upper part.

At the lower Part, five Veins enter each *Subclavial*.

The upper Intercoſtal. I. 1. *The upper Intercoſtal*, riſing from the Intervals of the three upper Ribs. But this frequently enters the Trunk of the Hollow Vein alſo.

The Mammary. II. 2. *The Mammary*, which however is not always inſerted into the Subclavial, but ſometimes into the Trunk of the Hollow Vein. The Roots of it are both Internal and External. The Internal ariſes from the griſtly Extremities of the Ribs, and their Intercoſtal Spaces, as alſo from the Glandules of the Paps: The External, from the ſtreight Muſcles of the Abdomen, the Glandules of the Teats, the Skin, and the Muſcles ſpread over the Breaſt.

The Mediaſtinum. III. 3. *The Mediaſtine*, which carries Blood from the *Mediaſtinum*, the *Pericardium*, and the *Thymus* Kernel: Though neither doth this always enter the *Subclavial*, but ſometimes the Trunk of the Hollow Vein.

The Cervical. IV. 4. *The Cervical*, which adheres partly to the ſlender Roots paſſing the lateral Holes of the Vertebers, the Pith of the Neck, or rather the Membranes wrapt about it; partly to the Muſcles next incumbent upon the Vertebers.

The lower Muſcula. V. 5. *The Inferior Muſcula*, which proceed from the Superior Muſcles of the Breaſt, and the lower of the Neck. This alſo ſometimes opens into the Exterior Jugular.

At the upper Part, three Veins enter the Subclavial.

The upper Muſcula. VI. 1. *The Superior Muſcula*, riſing from the Skin and the Muſcles of the Neck.

The Jugular. VII. 2. *and* 3. *The External and Internal Jugular*, whoſe Entrance is guarded by one thin Valve only, though there are two, looking from above toward the Subclavial, and preventing the Aſcent of the Blood out of the Subclavial to the upper Parts. *Riolanus* denies any Valve to the External, and boaſts himſelf the Diſcoverer of the Valve in the Internal, though there be no reaſon why the External ſhould want a Valve more than the Internal, ſince there is the ſame neceſſity of ſtopping the Reflux of the Blood out of the *Subclavial* into the one as well as the other.

Theſe Jugulars are ſeated in the ſides of the Neck, and adhere to the neighbouring Parts. They deſcend from the Head, and the Blood of the whole Head remaining after Nouriſhment, ſlides into them through ſeveral leſſer Veins and Hollowneſſes of the hard Meninx; for ſeveral Veins open into each Jugular with many Valves, hindring the Reflux of the deſcending Blood.

The Vena Frontis, Vena Puppis, *and the* Ranariæ. VIII. The External Jugulars admits two Veins, of which, the Exterior adheres with its Roots to the skinny Parts of the Head, Face, Top of the Head, Temples, hinder part of the Head, Cheeks, Noſtrils, the Muſcles adjoyning, and the Bones of the Jaws; and receives thin Fibres from the Menix's themſelves through their Sutures. Into this alſo the *Forehead Vein* ſeated in the Forehead, exhonerates it ſelf, ariſing from the Concourſe of the Vein on each ſide. Alſo the *Vena Puppis*, ſeated in the hinder part of the Head; the opening of which Veins is highly extolled in Diſtempers of the fore-part and hinder-part of the Head, as the Diſtemper lies. The Roots of the inner Vein are inſerted partly into the Mouth, that is, the Muſcles of the Chaps, Larynx, Hyoides, Palate and Tongue, under which they conſtitute the Ranaries or Hypoglottides, wont to be opened in Inflammations of the Chaps; partly into the inner Membrane of the Noſe. Some little diminutive Veins proceed alſo hither from the *Seith*, through the Hole of the Temple Bone.

The Internal Jugular Vein receives two Veins of each ſide, through the Holes of the *Cranium*; of which, the firſt which is the bigeſt, being produced from the Boſom of the thick Meninx, lying under the Lamdoidal Suture, and is continued with its Vein, which paſſes through the Bone of the hinder part of the Head in the ſixth Pair of the Nerves,

and

and admits an ascending Root from the Pith of the Spine. The other which is lesser proceeding partly from the thick Meninx passes through the holes of the second, third and fourth Pair of the Nerves; partly from the Organ of Hearing through the hole of
2. the Bone of the Temples.

CHAP. V.

Of the Axillaries *and Veins of the Arm.*

The Axillary Veins. I. THE Axillary *Veins are Continuous with the Subclavials, and indeed the same, only changing their Names according to the Diversity of Situation. For where it lyes under the* Clavicles, *it is call'd* Subclavial; *when it extends it self to the Arm-pits, it is call'd* Axillaris.

The Scapular Veins. II. *To the* Axillary, *at its first issuing forth from the Breast there come two lesser Veins* ; The Internal *and* External Scapularis; of which the one proceeds from the Muscles occupying the hollow of the *Scapula*, the other from the Muscles covering the *Scapula's*.

A little farther, at the very beginning of the *Axillary*, two larger Veins are continu'd with it, which pour forth the Veiny Blood of the whole Arm into the *Axillary*, of which the upper is called the *Cephalic*, and the lower the *Basilic*.

The Cephalic Vein. III. *The* Cephalic (*which is also call'd* Humeraria, *and the outer Part of the Elbow*) so call'd, because the ignorant Anatomists in former times thought this Vein descended directly from the Head to the Arm, and brought its Blood along with it, and therefore in Distempers of the Head prescrib'd it to be open'd before any other Vein, whereas this Vein ascends from the Arm to the *Axillary*, and neither receives from, nor carrys any thing to the Head; but only empties the Blood ascending from the lower Part of the Hand into the hollow Vein through the *Axillary*.

Now this *Cephalic* in Human Bodies enters the *Axillary* at the upper Part, and sometimes but rarely runs forth with a little Branch toward the External Jugular, for in many Four-footed Beasts it is inserted into the External Jugular.

IV. It receives Blood from the Hand, and Parts adjoyning to the Arm, into which the Roots of it are inserted. For from the outer seat of the Hand, after the *Salvatella* or *Suele* of the *Arabians* is form'd between the Ring and Little-finger, several Branches arise, making a Conflux into this *Cephalic* about the Elbow; which *Cephalic* ascends from the Elbow along the superficies of the Elbow, to the Shoulder, between the fleshy Membrane, and the Tunicle of the Muscles; receiving as it runs little small Veins from the Muscles of the Arm and Shoulder. *The Salvatella.*

V. *The Basilic Vein*, which more below and more inward enters the *Axillary*, exceeds the Cephalic in Magnitude; and in the Right Arm is call'd the *Hepatic*, in the Left the *Spleen Vein*, for the Distempers of which the Ignorance of former times order'd them to be opened as the Distempers lay. *The Basilic.*

The Basilic receives Blood from the lower and adjoyning Parts. From each finger two, from the Skin of the hand as well outward as inward several Ramifications grow, which first unite into four, and those about the Joynt of the Elbow into two Veins. Of which the one lyes very deep conceal'd; the other under the Skin. These both ascend upward from the bending of the Elbow. The profound one, along the Bone of the *Radius* and Elbow; the other along the outer Parts; and both receive several branches from the adjacent Parts, as well Exterior as Interior. When they come to the Shoulder they unite together in one Vein. Into which two other Veins Insinuate themselves besides the Cutaneous Vein of the Shoulder and Breast.

VI. 1. *The Upper Thoracy*, which rises from the Skin, and the Inner Part of the Pectoral Muscle, and the Hand. *The upper Thoracy.*

VII. 2. *The Inferior Thoracy*, adhereing with its Roots to the broad Muscle and the whole side of the Breast, and some affirm that it unites with the Orifices of three or four of the Intercostal Roots of the *Azygos*. *The lower.*

The Median or common Vein.

VIII. *Out of the* Basilic *and* Cephalic *is made a third Vein, of which that Part which is in the midst between the said Veins is call'd* Mediana, *or the Common Vein*, as being made of both concurring a little below the bending of the Elbow. This is double; the one conspicuous under the Skin; the other, lying deep; but both inserted with many Roots into the Hand and Fingers, as also into the Membranes and Muscles of the Hand and Elbow.

It would be a difficult thing to describe all the divarications of the small Veins belonging to the hand, though some have in vain attempted it. So frequent are the Conjunctions, Intermixtures and Distributions. And therefore we leave those exact investigations to such as have more patience and more leasure. And what I say of the Hand is also to be said of the Feet.

CHAP. VI.

Of that Part of the Vena Cava *below the* Diaphragma, *and the Veins discharging themselves into it.*

AS all the Parts seated above the *Diaphragma* transmit the residue of the Blood remaining after Nutrition through the lesser Vein to the *Vena Cava*, so do all the Parts below the *Diaphragma*.

The Veins of the Liver

I. 1. *Through the broad Orifice, where it adheres to the Liver innumerable little Veins discharge themselves out of the Liver into the* Vena Cava. Between which and the *Vena Porta*, there is said to be a great communication. *Riolanus* mentions a *Valve* within the Trunk of the hollow Vein near the Liver, to let in the Blood out of the Liver into the hollow Vein, but to prevent its egress into the Liver. This he says was discover'd by *Stephanus* and *Silvius* and found in Cows, but whether in Men or no, he knows not.

The Adiposa.

II. 2. *The Adipous or Fatty Vein, both right and left.* The left proceeding with its Roots from the Exterior Membrane of the Kidney, the Fat of it, and the Kernel laid upon it, is inserted into the Left side of the Trunk of the hollow Vein a little below the Emulgent. The Right, proceeding from the same Parts most commonly approaches the higher and middle *Emulgent* Channel, but seldom both enter the Emulgent, and more rarely the hollow Vein.

The Emulgent.

III. 3. *The Emulgent, large, but short, and both right and left.* These each of them adhere with their stringy Roots to the Kidney of it's own side, which meeting at length about the middle and hollow Part of the Kidney, break forth out of it sometimes with one, two, three, and sometimes more Branches, after their egress concurring into one short and broad Channel, which descending somewhat obliquely opens with a broad Orifice into the Trunk of the hollow Vein, the Left in a place somewhat higher then the Right. At the Orifice of the Emulgent gaping into the hollow Vein stands a remarkable *Valve*, looking upward from the Inferior Part of the Orifice and granting a free Influx of the Blood out of the Kidney into the hollow Vein, but preventing the reflux of it into the *Emulgent*.

There is great variety in the Number of the Emulgents; which though most commonly are from each Kidney, yet sometimes two, many times single by themselves, many times meeting half way, fall into the *Vena Cava*; and only one rises from one Kidney, and two from the other.

Sometimes a Branch descends from the Breast to the *Emulgent*, which is believed in this place to intermix with the Roots of the *Azygos*, and here and there to unite. Sometimes a Branch slides down to the *Emulgent* from the Loins and Spinal Pith. Seldom any Branch is extended thither from the *Succenturiated* Kernel. Sometimes also little Branches gape into it from the Neighbouring Parts; for Nature often varys in these particulars.

The Spermatic or Seminal.

IV. 4. *The* Spermatic *or* Seminal, *of each side one, a Right and Left.* *Riolanus* writes, that sometimes in Lustful Persons that have been hang'd for Adultery, he has often found these Veins double especially on the Right side. But there is no certain Reason why men should be more Lustful for

that;

that; and therefore I queſtion his Aſſertion.

The Right-hand Vein enters the higher Part of the Trunk it ſelf, below the Emulgent of the ſame ſide, which has been often obſerv'd by *Galen* and *Veſalius*. At its enterance into the hollow Vein, it bunches forth with ſomewhat a thick Prominence; which *Riolanus* believes to proceed from the Valve diſtended by the aſcending Blood, and looking toward the hollow Vein. This Valve by reaſon of its extream ſmallneſs and ſlenderneſs can hardly be ſhewn, but reaſon perſwades us it muſt be there; there being a neceſſity of ſome obſtacle to prevent the Blood from flowing back from the hollow into the Spermatic Vein. To which end 'tis probable that all the Veins gaping into the *Vena Cava* are ſo furniſh'd, unleſs the *Iliac* and *Subclavial*, whoſe Valves are more remote.

The Left Seminal enters the middle Left *Emulgent*, at the lower Part, guarded with a Valve at the Orifice. From this another Branch is ſometimes ſent forth to the Trunk of the *Cava*.

But Nature varies in the Spermatic Veins: for that their ends ſometimes enter the *Cava* on both ſides, ſometimes the *Emulgent* on both ſides; and the Left enters the *Cava*, and ſometimes though rare the *Emulgent* and *Cava* on both ſides with a forked end.

Theſe Veins riſe in Men without the *Abdomen* from the Teſticles themſelves, and the *Warty ſubſtance*, from which they carry back the Blood remaining after nouriſhment of the Parts, and generation of Seed to the hollow Vein, In Women they riſe within the *Abdomen*, partly from the bottom of the Womb and neighbouring Membranes, with innumerable ſtringy Roots; partly they riſe up from the Teſticles. Beſides, it has been obſerv'd by ſome that three or four Roots are extended further from the Spinal Pith.

The Lumbary. V. 5. *The Lumbaries, two, three or four*, which enter the Trunk of the *Cava*, at the hinder ſeat looking toward the Vertebres, ſo that their ingreſs cannot be perceiv'd but by raiſing the *Cava*. They proceed from the Lumbary Muſcles and the Spinal Pith, between four Vertebres of the Loyns through the holes of the Nerves perforated on each ſide, and receive on each ſide a little Branch inſerted into the involvings of the Marrow, and deſcending all along the whole length of it, through thoſe *Meninx's* that enfold it. This *Riolanus* believes at its beginning to be united by *Anaſtomoſis* with the beginning of the Root of the aſcending Jugular; which ſeems not probable.

The Iliacs. VI. 6. *The two* Illiacs, *large Veins, which about the fifth Vertebre of the Loyns, and the beginning of the* Os Sacrum, *enter the end of Trunk of the* Cava; ſo that the *Cava* ſeems to reſt upon theſe two Veins as upon two Thighs. A little above their Ingreſs into the lower Belly, beforethey are united with the *Cava*, they are guarded with a large Valve looking upward, which tranſmits the aſcending, but ſtops the deſcending Blood. Theſe *Iliacs* diſcharge into the *Cava* the Blood of all the Inferior Parts, brought to them out of the leſſer Veins which are under them.

CHAP. VII.

Of the Veins which open into the Iliacs.

The upper Muſcula and the Sacra. I. TO *Each of the* Iliacs, *about the ſame place, where it approaches the* Cava, *The Upper Muſcle extends it ſelf*, which proceeds from the *Peritonæum* and Muſcles as well as of the Loyns and *Abdomen*. Hither alſo reaches the *Sacred* Vein ſometimes ſingle, ſometimes double, which runs forth from the Membranes inveſting the Marrow through the Holes of the *Os Sacrum*.

The lower Iliaca. II. *A little lower a large Vein but ſhort enters the* Iliac *call'd the* Lower Iliac, into which only two leſſer Veins enter.

The middle Muſcula. III. 1. *The middle Muſcula*, at the outer Seat, which with its Roots adheres to the Inferior Muſcles of the Thigh, poſſeſſing the Seat of the Hip; as alſo to the Skin of the Buttocks and the Adjacent Parts.

IV. 2. *At*

The Hypogastric.

IV. 2. *At the inner Seat the* Hypogastric; which is larger then the first, sometimes double to which most of the Veins of the *Hypogastrium* are carry'd.

1. In Men, several little Branches from the Yard and Bladder.

2. In Women, several Branches from the Bladder, but more from the Bottom and Neck of the Womb.

The external Hæmorrhoidals.

3. *The External* Hæmorrhoidals, from the Streight Gut, or the *Podex*.

4. A Branch from the Parts adhereing to the Hole of the Share-bone, which perforating the Tenth Muscles of the Thigh, and *Peritonæum*, reaches hither.

The Epigastric.

V. *Where the* Iliac *admits this Inferior Branch, in a place somewhat lower it receives from above the* Epigastric, adhereing with its Roots to the Womb, Skin of the Groins, and Muscles of the *Epigastrion*, especially the streight ones. To the Roots of these are joyn'd the two *Mammary* Roots under the Muscles of the *Abdomen*, near about the Navel; thence ascending to the Teats, but not United with the *Epigastrics* by *Anastomosis*, whatever *Laurentius*, *Fallopius*, *Bauhinus*, and other *Anatomists* Write, *vid. l.* 1. *c.* 5. *& l.* 6. *c.* 3.

A little below the *Peritonæum*, two more Veins open into the *Iliac*.

The Pudenda.

VI. 1. *The* Pudenda, which enters the inner Seat, before the *Iliac* Branch enters into the *Peritonæum*; rising in Men from the *Scrotum* and Skin of the Yard; in Women, from the *sinus Muliebris*, the Lips of the Privities, the *Nympha*, and Parts adjoyning.

The lower Muscula.

VII. 2. *The Inferior* Muscula, which adheres with its Roots to the Skin and Muscles possessing the Hip, and the Muscles adjoyning.

CHAP. VIII.

Of the Crural *Veins, and Veins of the Foot.*

The Crural *Vein.*

I. THE Crural *Vein in both Thighs is continuous and the same with the* Iliac, and only changes its Name according to it's Situation; for that rising from the Foot it is call'd *Crural*, as far as the Groin, but when it is goes about to enter the *Peritonæum* it is call'd the *Iliac*.

This *Crural* is a great Vein, into which the lesser Veins of the whole Thigh discharge the Blood remaining after Nutrition, to be conveigh'd to the *Cava*. But in the folding of the Thigh where it is accompany'd with Nerves and Arteries, it is underpropt with several Kernels.

Besides many other small Veins, the *Crural* receives from the neighbouring and lower Parts six remarkable Veins, 1. The *Saphæna*. 2. The lesser *Ischias*. 3. The *Muscula*. 4. The *Poplite*. 5. The *Sural*. 6. The larger *Muscula*.

The Saphæna.

II. *The* Saphæna, *is the longest, and most remarkable unaccompany'd by any Artery, adhereing to the Foot and Toes with its lowest Roots*, of which some uniting at the upper Part of the great Toe, make the Vein vulgarly call'd the *Cephalic*; and this proceeding farther, and meeting again with other Veins in the inner Part of *Malleolus*, constitutes the said *Saphæna*, which is usually open'd in Distempers of the Womb; which ascending hence between the Skin and the fleshy Panniclé through the inner Parts of the Thigh in the mid-way admits several little Veins into the Leg, Thigh and Knee. The Roots of which adhere to the Skin, Muscles and other neighbouring Parts, and so at length it enters the *Crural* Vein near the Groin.

The lesser Ischias.

III. *The lesser Ischias*, proceeding from the fore-part of the Hip, and the Muscles of that Place, at the Exterior seat approaches the *Crural*, right against the *Saphæna*.

The Muscula.

IV. *The* Muscula *being double, the Exterior which is the lesser arises from the second and fourth Muscle extending the Leg; and from the Skin.* The innermost, which is the larger and deep

deep, proceeds from the Knee and almoſt all the Muſcles of the Thigh, eſpecially from the fifth, and the third extending the Leg. Theſe two, directly oppoſite one to another, enter the Crural within the Groins.

The Poplitea. V. *The Poplite Vein*, adheres with its Roots to the Heel, and ſometimes to the Malleolus. Then aſcending upwards, it admits from the Skin and Muſcles of the Calf, oblique and tranſverſe Branches; and ſo perambulating the Muſcle of the Ham, is divided into two Branches, which being parted a little above the Ham, not far from one another, ſometimes one enters the *Crural*, and another the *Saphæna*. The opening of this Vein was very frequent among the Ancients in Diſtempers of the Kidneys, and preſcribed by *Hippocrates*.

The Sural. VI. *The Sural*, is a larger Vein, which about the bending of the Leg, and a little above, is joyned continuous to the Crural. It is formed out of the two Branches meeting above the Region of the Ham; of which, the Exterior riſes from the Toes and Extremity of the Foot (wherein meeting and concurring with the Roots of the *Poplite*, it forms that various Fold of Veins, conſpicuous under the Skin) the outer part of the *Malleolus*, and the Muſcles lying hid betwen the Button. The lower riſes from the great Toe, the Heel, and the Muſcle conſtituting the Calf.

The larger Iſchias. VII. *The larger Iſchias*, approaches the Crural, being deeply hid, a little below the Entrance of the *Sural*. This riſes from the Muſculous Subſtance of the Teeth and Toes, and ſo aſcending, penetrates the Exterior Part of the *Malleolus*, and in its farther Progreſs, admits ſeveral Branches from the forepart of the Leg to the Muſcle of the Calf and the Parts adjoyning, till at length it reaches the Crural, and opens its ſelf into it.

THE

THE EIGHTH BOOK OF ANATOMY. Concerning the NERVES.

CHAP. I.

Of the Nerves in General.

A Nerve is called by the *Greeks* νεῦρον from νέυω, to bend, and τόνος from τείνω to ſtretch. For that the Nerves give to the Muſcles a Power to bend and extend the Parts.

Some of which, *Galen* is the chief, divide the Nerves into three ſorts, *Ligamentous*, *Tendonous*, and *Nervous*. But only the laſt is a true Nerve, proceeding from the Marrow of the Brain. The other two rather Nervous Bodies, ſo called from their Reſemblance of hardneſs and drineſs; for that they neither proceed from the Marrow, neither are they ſimilar Bodies, but compoſed of Membranes and Nerves, and concurring little Arteries and Veins. But here we ſhall treat only of the true Nerves, proceeding from the Marrow.

The Deſinition. I. *A Nerve is an Organic ſimilar Part, white, long and round, appointed to conveigh the Animal Spirit.*

Its Subſtance. II. *The Subſtance of it is white, thick, and conſiſting of many ſlender Threads, growing together by the means of little Membranes, with no conſpicuous Hollowneſs, but endued with moſt ſuttle Pores, for the Paſſage of the Animal Spirits*; which that they are preſent within them, and diffuſed through them, both Wounds, and the Obſtructions wherewith they are afflicted, abundantly argue.

Whether hollow? III. *As to what I ſay, that they are endued with no manifeſt Hollowneſs*, the Authority of *Galen* is oppoſed againſt me, who writes, that the Optic Nerves are hollow; and where he ſays, *That the Influx of the Animal Faculty is hindered, when the Nerve which has a Paſſage, is either obſtructed or compreſſed.* From which Words of *Galen*, *Bauhinus*, *Riolanus*, *Gemma*, *Spigelius*, and others conclude, that the Nerves are hollow. Nay, ſome have aſſerted, that they have obſerved a manifeſt Hollowneſs in the larger Nerves, as in the Optics, and in the Trunk of the Nerve near the Hips. To which purpoſe they propoſe certain Conditions out of *Galen* and *Plempius*. 1. To make a Diſſection in a larger Creature. 2. To make

make uſe of a clear Light, and a ſharp Knife, for fear of compreſſing or extending the Nerve. 3. That it be divided beyond its Coition. Theſe Conditions obſerved, *Bartholin* writes, that he has both ſeen and ſhewn a Cavity in the Optics, which I will believe when I ſee it; for with all my Induſtry I could never find any. Their middle Subſtance is more Porous indeed, but never diſcern'd to be hollow, which *Veſalius*, *Fallopius*, *Coiter*, *Aquapendens* and *Columbus* aſſert to be true. Nor could we by any Art or Help of Microſcopes perceive any Cavity in any other of the Nerves. And therefore I believe thoſe Aſſertors of Cavity in the Nerves to be in an Error. And *Bartholinus* himſelf, who admits Cavity in the Optics, condemns the Opinion in general. As for the *Mamillary Proceſſes*, they are no Nerves, *Vid. l.* 3. *c.* 8. Nor are the ſpungy Bodies of the Yard Nerves, though erroneouſly ſo called; beſides that, Hollowneſs in the Nerves is againſt Reaſon: For they carry inviſible Spirits through the inviſible Pores of their Strings, but no conſpicuous Liquor, there being no ſuch thing ever known to flow from them, either upon Wounds or Diſſections. Moreover, ſeeing the Spinal Marrow, from whence they derive their Original, has no Cavities, much leſs the hard and dry Nerves that proceed from it. Now that the long Marrow is not hollow, we have often try'd, by means of a long Pipe, through which we could never make any Breath to paſs, though the Pipe being thruſt into the Diviſion, eaſily went to the end of it. Nor do *Galens* Words contradict my Opinion, who does not ſpeak of any ſenſible Cavity, but of an inſenſible Hollowneſs, meaning the Pores, in which reſpect they may be ſaid to be inſenſibly hollow.

Whether hollow?

Therefore ſays *Nellianus Glancanus*, *Though the Nerves do not appear ſenſibly perforated, yet they are eſteemed capable to conveigh the Animal Spirits: For that the Spirits is moſt ſubtil, and the Marrow of the Nerves ſo ſpungy, as to be eaſily penetrated by a ſubtil Spirit*, *Vid. l.* 3. *c.* 11.

The Subſtance is threefold.

IV. ***The Subſtance of the Nerves is thought to be threefold.*** The firſt the Internal Medullary Subſtance, proceeding from the Marrow of the Brain. The ſecond and third is the double Membrane, inveſting the inner Subſtance; of which, the one thinner and more inward, is the Production of the *Pia Meninx*; the other thicker and more outward, the Production of the hard Meninx: But this threefold Subſtance, though perhaps it may be conſpicuous in the Optic Nerves, in the reſt is rather to be diſtinguiſhed by Reaſon than Senſe: Seeing all the Nerves are only long Threads, wherein there is no Pith or Medullary Subſtance to be ſeen, whence ſome deny that there is any Marrow at all in the Nerves. And hence it is, that that the Nerves which ſeem to be compoſed of Threads only, are numbred among the ſimilar Parts; not that they are ſimply ſo, but ſeem to be ſo, and are all alike in all Parts.

Their Nouriſhment.

V. ***How the Nerves are nouriſhed, is hard to judge.*** *Veſlingius* allows them Veins and Arteries for Nouriſhment and vital Heat: For which reaſon, *Hoffman* will have them hollow. *Lindan* ſays, that all the Nerves are not only hollow, but admit a little *Capillary* Artery. *Stenonis* alſo believes, that he has obſerved Blood-bearing Veſſels between the Strings of the Nerves. We have our ſelves obſerved in the Optics ſome ſlight Foot-ſteps of a Blood-bearing Veſſel, paſſing and expanding it ſelf into the Net-reſembling-Tunicle, for the Nouriſhment of the Humors and Tunicles of the Eye; but never in any other of the Nerves. And therefore I hold the Opinion that extends to all the Nerves, to be groundleſs. 1. Becauſe never any ſuch little Arteries were ever diſcernible in any of the largeſt Nerves, except the Optics; and what *Stenonis* obſerved among the Threads, I ſhould rather think might be found in the enfolding Tunicles, if there were any ſuch thing. 2. Becauſe the narrowneſs of the Pores is not only extreamly ſtreight, but plainly inviſible, not able to admit a ſmall Hair, much leſs a Capillary Artery. 3. Becauſe the Pulſation of the Arteries would be a hindrance to the Paſſage of the Animal Spirits, eſpecially the Paſſage of the Nerve being ſtreightned by the Swelling of the Artery in a violent Pulſation of the Heart. 4. Becauſe that upon the Diſſection of any Nerve, not the leaſt drop of Blood appears to flow out of any Artery, ſuppoſed to be within ſide.

Whether they conveigh the nutritious Juice? Gliſſon's Opinion.

Gliſſon writes, that the Nerves, by conveighing the Animal Spirits, are not only ſerviceable to Senſe and Motion, but alſo carry a certain nutritive Humor for the Nouriſhment of themſelves and the Parts which they enter, and that they do not receive this Humor from the Muſcles, Bones, Heart, Lungs and

Kidneys, but from the Spleen, Stomach and Inteſtines, and partly alſo mediately from the Brain. But the narrowneſs of the Nerves is ſufficient to refute this vain Opinion; and we ſee that the leaſt Humor getting into them, obſtructs the Spirits and cauſes the Palſie. Beſides that, no Juice can be ſqueez'd out of the Nerve when hurt at any time; nor does the Nerve, being ty'd with any Ligature, either ſwell or grow languid in any Part; nor is there the leaſt Tumor to be obſerved, either about or beyond the Ligature. To this add the Experiment of *Regner de Graef*: *We laid bare*, ſays he, *the remarkable Nerve tending to the hinder Part of the Thighs, and ſlit it athwart through the Middle, and being freed from the Lymphatic Veſſels, put it into a glaſs Viol, ſuch as wherein we uſed to collect the Pancreatic Juice; the Neck of which was ſo narrow, that the thickneſs of the diſſected Nerve gently cloſed the Orifice of it, leaſt any Spirit, or whatever paſſes more ſubtle through the Nerves, might exhale into the Air. This Viol we fixed to the Skin, in hopes, that if any thing of liquid paſſed through the Skin, we ſhould by that means preſerve it; but all in vain. For during the ſpace of four or five Hours, not a drop came forth; nor could we perceive any ſticking of the Animal Spirits to the Sides of the Glaſs by Condenſation.*

Moreover, what *Gliſſon* propounds in the laſt place, is remote from Truth; for if any Liquor were received by the Nerves, it muſt neceſſarily flow into their Beginnings; but there are no Beginnings of the Nerves that open either into the Stomach, Inteſtines or Spleen; but they all proceed without Exception, from the long Pith of the Brain. Read what we have diſcourſed upon this Point, *l.* 3. *c.* 11. and a farther Refutation, ſee *l.* 1. *c.* 16.

Wharton *and* Charlton's *Opinion.*

VII. *Wharton* and *Charlton* admits this nutritious Juice, but will have it prepared and made in the Glandules, ſeated up and down in the Body, and appointed for this uſe. But in regard that only thick and viſible Juices are prepared in the Kernels, no way poſſible to enter the Nerves, and that Juice ought to flow with a contrary Stream to the Animal Spirits, and for that either none at all, or at leaſt no preceptible Nerves reach to the Glandules, moſt certainly it cannot be the Office of the Glandules to carry nutritious Humors.

Malpigius *his Opinion.*

VIII. *Malpigius* believes ſome notable Juice to be conveighed through the Fibres of the Nerves; but that it is derived from the Glandulous *Cortex* of the Brain, and for this reaſon he numbers the nervous Fibres among the Veſſels. *The nervous Fibres*, ſaith he, *are to be reckoned among the Sorts of Veſſels, which being cut, I have obſerved a certain Juice like the White of an Egg, and thickning before the Fire, to flow forth in a conſiderable quantity.* But ſtill what has been already ſaid concerning the ſtreightneſs of the Nerves, ſufficiently evinces the Falſhood of this Opinion; the Cavity of their Fibres being ſuch, as not able to tranſmit the thinneſt Juice.

The Nouriſhment of the Nerves.

IX. ***Therefore it is moſt probable, that the Nerves are nouriſhed by the Arterious Blood, but chiefly by the Animal Spirits.*** For though they admit no Blood-bearing Veſſels into their inner Parts, yet they are nouriſhed like the thin and thick Meninx in the Head by the Arterious Blood; the Exterior Tunicles of the Nerves, which are derived from the Menixes, receiving through their inviſible Arteries, ſome little Portion of Blood for their Nouriſhment, and communicating ſomething of the ſame Blood by Exhalation to the inner Subſtance. In the mean time it is unqueſtionable that theſe Tunicles, but chiefly the inner Fibres are more eſpecially nouriſhed by the Animal Spirits paſſing through them (*vid. l.* 3. *c.* 11) of which, the more fixed Particles growing to their Subſtance, turn to Nouriſhment. The Arteries and Veins are nouriſhed with the ſame Blood which they carry, and therefore why not the Nerves? which may be the reaſon alſo that they have ſuch a quick Senſe of Feeling, and have their peculiar hardneſs and drineſs; in regard the Spirits, with which they are nouriſhed, are like a moſt volatil and dry Salt, or like a dry and ſubtil Exhalation. And then, that beſides theſe Spirits, there is ſomething of Arterious Blood which concur to the Nouriſhment of the Exterior Tunicles, and communicates ſomething by exhalation to the interior Tunicles, is apparent from hence, that the Nerves being obſtructed, though they are deprived of Senſe and grow languid, yet they are not deprived of Life, nor dry up for want of Nouriſhment, for the Obſtruction being removed, they ſhall, after many Years, be reſtored to their priſtine Sanity. I knew a Woman ſo paralytic, on one ſide, for thirty years to-

together, that she had no use either of her Left-Arm or Thigh, besides that, all that side of her was num, till at length, the Fright of a most hideous Tempest, with Thunder and Lightning, having expell'd the Obstructing Matter from the Nerves, she was free'd from her Palsie, and walked abroad the next Day, to the Admiration of all that beheld her. Which could not have been, if the Nerves had been all that time without Nourishment; for they must have been dried up in so many years time; which they must have been, had they been only nourished by the Animal Spirits, which could not flow into the Nerve while obstructed. A Story much like to this, *Vallriola* reports of one that had been paralytic for several years, but suddenly freed from his Distemper by the Fright of a House on Fire. However those little Arteries are only derived from those that crawl through the Menixes of the Brain.

Their bigness. X. *The Nerves vary in bigness, according to the variety and necessity of their Use, the Organs to which they run forth, and the importance of the Actions which they are to perform.*

Their Original. XI. *The Original of the Nerves is twofold, in respect of Generation and Administration.* In respect of the first, they are generated from the Seed, as are all the solid Parts. In respect of the latter, from the Brain, or its appendent Matter. For, to reject the Opinion of *Aristotle* and others, that the Nerves arise from the Heart, or partly from the Heart, and partly from the Brain; we say that all the Nerves rise from the long Pith of the Brain, contained as well within the Brain, as the Cavity of the Spine. Which *Varolius*, *Picholhominus*, *Bauhinus* and others testifie upon orbicular View.

Their Passage out of the Pith. XII. *From that Pith they proceed all through the Holes of the Pith and Vertebres, but not all after the same manner.* For some pass through the Holes nearest the Place where they make their Exit; some pass by two, three or four Holes before they make their Egress. For the more the Marrow tends to the lower Parts, the more Holes the Nerves pass by, before they transmit themselves.

Softness and hardness. XIII. *The Nerves, some are softer and some are harder, according to the Variety of the Use, and Difference of Length and Situation, as also in respect of the Parts which they enter.* *Galen* writes, that their softer Parts are the only Parts that are sensible of feeling; but that those which both feel and move, are the harder.

The Use. XIV. *The use of the Nerves is to conveigh Animal Spirits to the Parts,* that by their ordinary Influx, Nutrition may go forward, and by their determinative Motion, that the Parts destin'd for Sense and Motion, may be made more sensible and more vigorous, *Vid. l.* 3. *c.* 11. To which purpose they are inserted into the sensible and moving Parts with wonderful Artifice. And those that move the Muscles are inserted into their Heads, or a little below or at least not beyond the Middle, of which Insertion see the Reason, *Lib.* 5. *Cap.* 1.

Why they be Instruments of Sense a Motion. XV. Hence some conclude, that they are the Instruments of Sense and Motion; whereas they are rather the Channels to which the Animal Spirits are conveighed to the Instruments of Sense and Motion. The Instruments of Feeling, are the Membranes, which the more Nerves they receive, the more acutely they feel; the fewer they admit the more dully. And this appears in *Palsies*; for though the Nerve be present, yet the absence of the obstructed Spirit causes the Defect of Sense. Now because the Nerves are furnished with Membranes, 'tis no wonder their Sense of Feeling is so quick; more especially, since they contain a greater quantity of Animal Spirits, which are the immediate Causes of the Senses. The Muscles are the Instruments of voluntary Motion, which the Nerves do not move by contracting themselves; but only by infusing into them store of Animal Spirits which cause the Motion.

Whether the Sensory and Motory Nerves are different? *Fernelius*, *Laurentius*, *Mercurialis* and others, observing in the Palsie, the Sense sometimes stupified, sometimes the Motion to cease, and sometimes both lost, thought the Motory and Sensory Nerves to be distinct, and that as the one or the other come to be obstructed, it causes a Variety in the Distemper. But there is no more diversity of the Nerves than of the Animal Spirits, only the diversity of Operations proceed from the diversity of the Parts which they enter. Thus they infuse into the Eyes, the Faculty of Seeing, into the Ears, the Faculties of Hearing, &c. Nay,

ſometimes one and the ſame Nerve inſerted into ſeveral Parts, contributes to one Sence only, to another both Sence and Motion. Thus the *Pleura*, *Mediaſtinum*, Stomach, and ſeveral other Parts, feel by means of the Nerves of the ſixth Conjunction, and by means of the ſame Nerves and Muſcles of the Neck, the *Hyoides*, *Larynx*, and other Parts, both feel and move. But *Willis* obſerving that the Stomach, Ventricle, Inteſtines, and many other Parts, had a Spontaneous Motion, though not arbitrary, believed there were two ſorts of Nerves, and two ſorts of Animal Spirits. One that aſſiſted ſpontaneous Motion, by means of the Spirits generated in the *Cerebel*; the other voluntary or arbitrary Motion, by means of the Spirits generated in the Brain. To which, what has been ſaid already will ſerve for Anſwer, that the diverſity of Motion does not proceed from the variety of Nerves or Spirits, but the diverſity of the Parts to which the Spirits are conveighed. Thus carried to the Muſcles, they cauſe arbitrary Motion; to places wanting Muſcles, but endued with moveable Fibres, they cauſe ſpontaneous Motion.

While Motion laſts there is always Sence.

XVII. Note by the way, that no Muſcle is moved which is not ſenſible at the ſame time, and that the Motion of the Muſcle may fail, and yet the Sence remain, but not the contrary; few Spirits being requiſite for the Sence of Feeling, but many to cauſe and perform Motion. And therefore it is a falſe Notion, that the Sence may fail in the ſame Member, and yet the Motion remain. For common Practice tells us, that ſometimes the feeling may fail in the Skin, ſo as not to feel the Heat of a burning Coal; but pierce the Skin with a Needle, and you ſhall find a moſt acute Sence in the Muſcles, moving underneath, which would not feel, if this Hypotheſis were true. As frivolous is the Example produced by *Regius*, of a young Man, who had loſt the Sence of feeling in his Hand, the Motion remaining; for I can never believe any Perforations were made to the Muſcles in that Hand, which had they been done, *Regius* muſt have been of another Opinion; but Perſons as ignorant as himſelf will believe any thing.

But theſe Phyſitians ſeem not to have obſerved, that this Stupidity of the Sence is not in the Muſcles, but only in the Skin, or perhaps in the cutaneous Pannicle, which being vitiated, they thought the inner Parts of the Member to have loſt the Sence of Feeling. So that the Miſtake proceeds from hence, that becauſe the Sence of Feeling failed in the Skin, which might happen through vitious Humors obſtructing or contracting the Pores of the Skin, or elſe Extremity of benumming Cold, the Phyſitian never minded the Muſcles, which had they diligently inſpected, they had found by them, that the Sence never fails in them while the Motion remains.

Obſervations.

XVIII. I ſhall clear this by ſome Examples. A Woman came to me for Advice, ſhe mov'd all her Limbs indifferent well; but her Skin, that was wrinkled and ſomewhat cold, had no feeling in it, though prick'd with a Needle, or held to the Fire; but if you thruſt the Needle deep into any Muſcle that lay underneath, ſhe was preſently ſenſible of the Pain of the inner Muſcle. In like manner I met with a Seamen, returning Scorbutic from the *Eaſt Indies*, who had no more feeling in his Skin than a Stone, though you held his Hand to a ſcorching Fire. But if you thruſt a Needle more deeply into the Muſcles, he was preſently ſenſible of Pain. The ſame Story I could tell of a Tobacco Merchant, whoſe Skin had quite loſt its Feeling; but when you pricked him to the Muſcles, he was preſently ſenſible of the Pain. So that moſt certain it is, that in the moving Parts the Sence never fails, unleſs at the ſame time the Motion alſo fail.

The Error of Philoſophers.

XIX. They that imprudently maintain this Argument, aſſert, that Sence is contributed to the Parts by the little Fibres of the Nerves; but Motion by the Animal Spirits, which flow into the Muſcles through their little Pipes in great quantity, and ſo that the Fibres may be obſtructed, though the Paſſage of the Animal Spirits may be free; by which means the Sence fails, the Motion remaining. On the other ſide, that the lower Cavity may be obſtructed, the Fibres remaining free and entire, and then the Motion fails, the Sence remaining perfect. True it is, that the Nerves feel by reaſon of the Fibres and Tunicles proceeding from the *Meninx*; but that they contribute Sence to all the feeling Parts by means of their little Fibres, is altogether falſe. For they are not the little Fibres, but the Animal Spirits flowing through the Poroſities of the Nerves that cauſe the Faculty of Feeling in all the membranous Parts; without the Influx of which, the

little

little Fibres never feel, as appears in the Palſie. And hence it appears, how abſurd it is to ſay, *That the inner Poroſity being obſtructed, and the Paſſage of the Spirits by that means hindred, the Motion fails, but the Sence remains*, ſeeing that the Sence proceeds from the Influx, and fails without it. But it may be objected, that though the inner Poroſity of the Nerve be obſtructed, yet a ſufficient Quantity of Spirits may paſs through the Subſtance of the Fibres to create Motion. But in the ſame manner it may as well be ſaid, that the Artery being obſtructed within ſide, and the Paſſage of the Blood being hindred, ſufficient vivific Heat and Spirit may pass through its Subſtance to preſerve the natural Heat of the Parts; whereas the Preſervation of the Heat proceeds from the due Influx of the Blood, and that failing, the Heat alſo fails in the upper Subſtance of the Artery, which is warmed and nouriſhed by the Subſtance that paſſes through it. Beſides, how can the inner Cavity of a Nerve or Artery be obſtructed without the Compreſſion of the little Fibres and the Subſtance it ſelf? For that if the obſtructing Matter exactly cloſe up the inner Cavity, ſo that the moſt ſubtil and inviſible Spirit cannot paſs, of neceſſity it muſt more cloſely compreſs the Subſtance of the Veſſel and the little Fibres, ſeeing that without ſuch an exact Compreſſion, the Stoppage cannot be; but the Subſtance being compreſſed with the little Fibres, the Pores therein, and the Fibres are quite ſtopped up, and they being ſtopped, how ſhall the Spirits paſs, either through the Fibres or the Subſtance? Then again, ſeeing that in the Motion of the Muſcles their Fibres and Membranes muſt require a greater quantity of Animal Spirits, which Spirits cauſe a quick Sence of feeling in the Fibres and Membranes, how is it poſſible, that a great quantity of Spirits being employed toward Motion, which the Fibres and Membranes neceſſarily ſupply at the ſame time with the ſame Spirits, ſhould be deprived of Sence, which requires much fewer Spirits than Motion? Is not the Feeling granted, by granting the neceſſary Means of Feeling? But this Axiom they ſeem to reject, who ſay, that the Feeling is loſt in the Muſcle, yet grant that many Spirits flow thither to compleat the Motion. Laſtly, they ſhould prove that there is an inner Cavity in the Nerves, which could never yet be made out by any Perſon in the World.

Whether Sence be made by the Spirits.

XX. ***But there ariſing another Queſtion, while many believe Senſation to be communicated to the Brain by the Animal Spirits contained in the little Tubes and Membranous Subſtance of the Nerves; others by the little Fibres of the Nerves.***

The firſt Opinion ſeems leſs probable, becauſe the Animal Spirits are continually preſſed away from the Brain through the Nerves, but never aſcend or return from the Nerves to the Brain; and this ſeems ſtrange again, that the Ideas imprinted in the Spirits ſhould in a moment of time be carried from the remoteſt Members of the Body, againſt the Stream of the Spirits, to the Brain, to be there offered to the Mind. Nevertheleſs *Gaſſendus* deſcribes a ſingle way, by which he believes, this return of the Spirits to the Brain may be effected. *For*, ſaith he, *a Nerve, or little Nerve cannot be touched, but it muſt be compreſſed; nor can it be compreſſed, but the Spirit contained muſt be provoked by Diſtention, and being ſtirred, it muſt puſh forward, or rather repel the next to it, and by the ſame reaſon, the Spirit coming from the Brain; nor can that be repelled, but the whole Series, by reaſon of Repletion and Continuity being repelled, the Spirit at the beginning of the Nerve flies back to the Brain. And therefore it is that the Faculty of Sence reſiding in the Brain, is moved by this flying back, and preſently perceives and apprehends the Touch which is made.* And afterwards he adds, *That nothing is ſent, but rather ſeems to be remitted and repelled; that is to ſay, the Spirit contained in the Nerves; neither does it appear that any thing elſe can touch the Brain.* But after this manner the Nerve being compreſſed, the Spirit flowing into it, being by that Preſſure hindred from any farther Paſſage, may be ſtopp'd indeed, but no way repelled to the Brain, or any Idea-carrying Motion be made from thence to the Brain, becauſe the continual Preſſure, or impulſive Motion of the Brain it ſelf, is an Obſtacle to hinder the Spirits from being ſo ſtrongly provoked toward the Nerves or their Ends, that no contrary Motion can repel them to the Brain; and that ſo much the leſs, for that granting a ſtopping Cauſe, yet there is no other repelling Cauſe. Therefore it is with the Nerves, as with the Arteries; for the Arteries being ſqueezed, the Blood is ſtopped from paſſing, but does not flow back to the Heart, becauſe the Pulſation drives it

ſo

ſo ſtrongly from it, that it cannot by any outward Preſſure, return again through the Arteries to the Heart: And thus, ſeeing the Brain with the ſame force expels the Spirits from it into the Nerves; and ſeeing alſo that when any contract is made in any of the remoteſt Parts of the Body, it is perceiv'd at the very ſame moment in the Head; and in regard ſo rapid a Motion of the Spirits from the Foot to the Head cannot be comprehended by thought; neither by reaſon of Repletion or Continuity, the Spirits being prohibited farther, paſſes through the Preſſure of the Nerve, can thoſe Spirits which are at the Original of the Nerve fly back to the Brain, becauſe of the Propulſion aforeſaid, by which, the Brain by its own proper Motion urges the Spirits continually toward the Nerves, not permitting any to fly back. Laſtly, ſeeing that by that Stoppage of Spirits, no Idea of feeling, whether ſoft or hard, *&c.* can be carryed to the Brain from the thing felt, and there be repreſented to the Mind, it is manifeſt that *Gaſſendus*'s Opinion is but a Fiction.

Whether Senſe be made by the little Fibres of the Nerves.

XXI. *The latter Opinion, that Senſation is cauſed in the little Fibres conſtituting the Body of the Nerve,* though more plauſible, yet it is hard to underſtand, how in a moment of time the ſpecific Image of Senſation can be carried from the Thigh to the Brain, through the ſolid Subſtance of little Fibres and Nerves to be there apprehended by the Mind. I know that ſome would make this out by the Similitude of the Strings in a muſical Inſtrument, which being touch'd at the lower end, will tremble at the ſame time at the top. But in the Bodies of Men, there is not ſo ſtrong a Tenſion of the Nerves, nor that ſtreightneſs of Situation, as in Strings pegg'd up; but a great Laxity and Contortedneſs, and a manifold Connexion every where with the Parts, that ſuch a continued Trembling ſhould happen in the little Fibres of the Nerves. Which *Gaſſendus* obſerves, where he ſays, *That it is not the Spirit contained, but the containing Tunicle, which by reaſon of its Continuation and Diſtention to the Brain, carries the Affection thither. But becauſe the Nerves are not extended in a ſtreight Line, like the Strings of a Lute, but contorted and relaxed, they cannot repreſs the Motion which is made at one End in the other Extremity.* *Lewis de la Forge* oppoſing theſe Words of *Gaſſendus*, proves indeed, that the Perception of Senſe is cauſed by the Spirits flowing from the Part felt to the Brain; but does not ſufficiently convince us, that this Perception is cauſed by the Motion communicated to the Brain. His whole Argument reſts upon the Influx of the Animal Spirits into the little Fibres of the Nerves, which are thereby kept continually ſtretched. But that looſe Tenſion is not ſufficient to enable a ſmall Nerve that has ſo many Windings from the Foot to the Head, and intervening Connexions to extend its Motion, being lightly touched in the Foot, ſo ſuddenly to the Brain. The Noiſe of a Gun does not preſently reach the Ear, through the Air, which is a yielding Body; conſequently there is a longer ſpace of time required in the ſolid Body of a Nerve, paſſing through ſo many intricate and various Turnings, and yet at the very individual point of time that the Foot is touched, the Idea of the Touch is felt in the Brain. So that the Touch and the Perception ſeem to be both at the ſame Inſtant, which could not be, if the Motion of the Fibres were to extend it ſelf to the Brain before the Touch could be perceived in the Brain. If it be objected, that this is done by the Continuity of the Nerve: I anſwer, that it may be done in hard extended things, but not in ſoft and languid. Thus, if you ſet a Stick twenty foot long to the Ear, and ſlightly ſtrike the t'other end, the Ear will preſently perceive the Percuſſion; but take the Gut of any large Beaſt, and put it to the Ear blown up with Wind, and hold it to the Ear, and ſtrike at the other end, the Motion ſhall never extend it ſelf much above a Span, much leſs will it reach the end next the Ear. And ſo it is with any Motion made in a ſoft, languid and contorted Nerve, at a diſtance from the Head. Beſides the Nerve is compoſed of innumerable Nerves ſo ſtrongly adhering together, that they cannot be parted aſunder but by force. Now if any ſmall Fibre be moved in the Foot, how ſhall that Motion reach the Brain, when none of the reſt which are annext to it, never ſo much as ſtir? If you ſay, the firſt being moved, the reſt move, and ſo the whole Nerve moves, then the Perception of the Brain will be uncertain, not being able to judge whether the firſt Motion were in the Toe, or any other Part of the Foot.

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Des Cartes makes mention of this Queſtion, and the better, as he thinks, to explain it, *We are to underſtand*, ſays he, *that thoſe little Threads, which, as I ſaid, ariſe from the innermoſt Receſſes of the Brain, and compoſe the Marrow of thoſe Nerves, are in all the Parts of the Body, which ſerve for the Organ of any Senſe, and theſe Strings may be moſt eaſily mov'd by the Objects of thoſe Senſes. But when they are mov'd never ſo little, preſently they attract the Parts of the Brain from whence they derive their Original, and at the ſame time open the Paſſages of ſome Pores in the foremoſt Superficies of the Brain. Whence the Animal Spirits taking their Courſe, and carried through the ſame into the Nerves and Muſcles, ſtir up Motions altogether like to thoſe with which we alſo are excited, our Senſes being affected after the ſame manner.*

Here the two former Opinions ſeem to be joyned together by the moſt excellent Philoſophers of our Age, to extract the Perception of the Senſes out of this Conjunction. For he believes that the Idea of the Object is to be carried through the ſmall Fibres to the Brain, and that then in the Brain, certain Pores being opened, the Animal Spirits flow through the Poroſities of their Fibres into the Nerves and Muſcles, and ſo excite a Motion which cauſes the Perception. But ſtill I wiſh that this ingenious Invention would teach us, how at the ſame inſtant of time, that Motion of the Fibres can be carried from the Toes to the Head, and at the ſame Inſtant, the Influx of the Spirits from the Brain to the Feet. Mechanics here will not ſerve turn. Pull a Rope, ſays he, at one end, and the Bell at the other end of the Rope will preſently ſound: But the Parallel will not hold. For in Man there is a rational Soul and Life: Now the Soul perceives, and moves the Parts without any external Object. 'Tis otherwiſe with a Bell, which is void of Life and Soul, nor can be moved but by ſome external Agent, and conſequently has need of other Organs than a living Body. For Example; the Rope does not move the Bell, unleſs pulled by ſome external Mover; but there is no ſuch Mover, or pulling in the Nerves or their little Fibres, much leſs in the ſoft and marrowy Subſtance of the Nerves. When a Man lyes crumpled up ſeveral ways in his Bed, there is neither Sreightneſs nor Tenſion, but many times a Compreſſion of the Nerves, and yet he feels the leaſt Prick in his little Toe. Is the ſoft Medullary Fibre of the Nerve, notwithſtanding the crooked Poſture of the Body moved through ſo many Windings and Turnings to the Innermoſt Receſſes of the Brain? Is there then any Tenſion of the Fibres and Nerves? Rather will there not be ſome Preſſure to intercept and ſtop that Motion? No, ſays *Des Cartes*, becauſe theſe Fibres are included in thoſe little Tubes through which the Animal Spirits are carried into the Muſcles, which always ſwelling, thoſe little Tubes prevent the little Threads from being too much compreſſed. As if, when the Nerves are up and down compreſſed by that crooked Poſture of the Body, thoſe fictitious Tubes remained open and diſtended, to prevent the Compreſſion of thoſe little Strings. Now compare the two Sentences of *Des Cartes*, from his Similitude of a Bell-rope, he ſays, the more extended the Nerves are, the more eaſily and ſuddainly thoſe Threads are moved to the innermoſt Receſſes of the Brain. On the other ſide, in another place he ſays, that the Filaments that ſerve the Organs of Taſte, are more eaſily mov'd than thoſe that officiate for the Senſe of Feelling, becauſe they are more relaxed. Shall then the more relaxed String more ſuddainly and eaſily be moved, than another more diſtended? Laſtly, I would fain know, whether that thin inviſible Fibres being mov'd, has any Faculty to open in the Brain any Pores for the Influx of Spirits. This is an Action of the Mind, not of any Nerves or Fibres: For the Mind can open or ſhut the Pores, ſometimes of theſe, ſometimes of thoſe Nerves, and has power to appoint the Spirit to theſe or thoſe Parts, in greater or leſſer quantity, *vid. l. 3. c. 5.*

The Determination of the Spirits by the Nerves.

XXII. ***No leſs difficult it ſeems to explain, how the determinative Motion of the Spirits through the Nerves proceeds, and how they come to flow and ceaſe to flow, ſometimes into theſe, ſometimes into thoſe Muſcles ſo ſuddenly, in a moment of time.*** A Queſtion which the Ancients, by reaſon of its difficulty, car'd not to meddle with. But lately, *Regius* has undertook the Point, and tells us there are many Valves in the Nerves, for the opening and ſhutting of which, the Animal Spirits flow and re-flow, ſometimes to theſe, ſometimes to thoſe Parts, according to the determination of the Mind. But not to believe any thing raſhly, no man ſhall

ſhall perſwade me that there are any Valves in the Nerves, the opening or ſhutting of which, either admits or reſtrains the flowing or reflux of the Animal Spirits, according to the determination of the Mind, the leaſt ſhadow of which could never be demonſtrated by any Anatomiſt that ever I heard of, ſo that this Opinion falls to the Ground.

Firſt, Becauſe that if the determinated Influx of the Spirits ſhould take effect, the Soul while it finiſhes thoſe determinations, would only be employ'd in the opening and ſhutting of thoſe Valves, but not in the Emiſſion of Spirits (for thoſe flow continually and ſpontaneouſly through the Impulſe of the Heart and Brain) like an Organiſt; who laying his Fingers upon theſe or thoſe Keys, cauſes the wind to enter theſe or thoſe Pipes from the Bellows according to his own determination, and as he opens or ſhuts the Valves of the Pipes with his Fingers, ſo the ſeveral ſtrings in the Brain, from whence the Operations of the Mind proceed, ought to be extended, like the conveyances of an Organ, to the ſeveral Valves of the Nerves by which they may be ſhut or opened at pleaſure. But in regard that many times one Nerve ſends it Branches to many Muſcles; as the Turning-back Nerve, ſends its Branches to many Muſcles, Hyoides, Neck and other Parts, and ſeveral to the *Diaphragma*, conſequently there ought to be Valves belonging to every Branch, from each of which peculiar ſtrings ought to be extended to the Brain, and ſo ſhould aſcend of-times through one Nerve, which runs out to various Parts, though very ſlender, like the Vagous Nerve of the ſixth Conjunction, a hundred, two hundred, or more according to the Number of the Valves; but that there are ſuch Filaments, there is no Man of reaſon but may eaſily conceive.

Secondly, Seeing that as thoſe Valves are open'd and ſhut, the motion of the Parts is ſaid to be ſwifter or ſlower, and for the ſame reaſon by the determination of the Mind, the Senſe of Feeling would move more or leſs acute at pleaſure nay ſome times would intermit; which that it never happens is known to all Men. Any Man may either move or not move his hand as he pleaſes, but he can never ſo move it at his pleaſure, but the Skin of the Hand ſhall be more or leſs ſenſible of it, which he might do if thoſe Valves were allow'd in the Nerves, and were mov'd at the determination of the Mind.

Thridly, Perhaps you'l ſay theſe Valves are not mov'd like the Valves of an Organ by the help of Keys, but that they are open and ſhut by the Influx of the Animal ſpirits. But this is eaſily refuted: for that the Animal ſpirits flowing into the Nerves from the Brain and Pith, always proceed directly, but that they never return, is apparent from the continual expulſion of the Brain, but repelling of nothing. Now in their progreſs, their paſſage is always open through the Valves, ſo ſeated, as to give free egreſs. But what is that which in the various determination of the Spirits ſhuts and opens them again in a moment of time? The Spirits flowing in, only open the Valves; and there is no Spirit allowed to return, becauſe there is nothing that can expel it; nor can the Soul do it; for what is already flow'd into the Nerves, out of the Brain, is without the Inſtruction of the Determiner; having already perform'd the Commands of the Mind by its Efflux, neither can it in a moment of time recal it at *Libitum* back from the Part, becauſe the Blood and Spirits are always mov'd forward in the Bodys by Impulſion, but never repell'd by the ſame ways.

Fourthly, Valves are allow'd in Bodies that have a manifeſt Cavity, as the Milky, Lymphatic Veſſels and Veins; where there is only a ſpace for Expanſion; but in the Nerves there is no Cavity to be diſcerned; beſides that in the Cure of a wounded Nerve, we have ſeen thoſe Filaments which were cut off, to the great pain of the Patient, as long as a Mans Hand ſeparated from the reſt not cut off, the reſt remaining entire about the half way of the Nerve, and the Cure being perfected, officiating as before; and yet in ſuch rare accidents could we obſerve any hollowneſs in the Nerves: and had there been any Valves therein, they muſt have been dilacerated upon taking away half the length of the Nerve, nor could the Nerves have afterward, as they did, perform their duty.

Des Cartes and his Followers, to avoid theſe Rocks, tells us, that the Valves are only in thoſe places of the Nerves, where being divided into Branches they enter ſeveral Muſcles. And ſo they write, that one Muſcle being dilated by the Spirits more impetuouſly flowing into it from the Brain, and ſwelling at its full breadth, and contracted

contracted at its full length, by the compreſſion made by the dilated Muſcle, the Spirits are repell'd upward, and forc'd into that Valve ſeated at the Biforcation of the Nerve. So that when they cannot paſs it, they preſently flow into the other Branch of the Biforcation to contract and encreaſe the ſwelling of another adjoyning or oppoſite Muſcle. But this is eaſily refuted, for that the Ramifications of the ſame Nerve are inſerted into the Muſcles, either adjoyning or oppoſite, and moving the Members by contrary motions, ſo that there can be no ſuch regreſs of the Spirits to the Valve ſeated next the Biforcation, there being many times no ſuch Biforcation, but only ſeveral Muſcles receiving ſeveral Nerves.

The difference of the Nerves.

XXIII. ***The Nerves differ in reſpect of their ſubſtance and quality***; ſome are thicker, ſome thinner; ſome ſofter; as thoſe which proceed from the Marrow within the *Cranium*, as alſo thoſe which extend but a ſhort way to the Senſitive Parts, or require but little Motion, and proceed from the Pith without the Brain. 2. In reſpect of their Quantity, ſome are large, ſome ſmall, others long, others ſhort. 3. In reſpect of their riſe, ſome from the Pith within, others from the Pith without the *Cranium*. 4. In reſpect of the Pairs; ſome more Porous, as the *Ceptics*, ſome leſs, as the reſt of the leſſer Nerves.

The numbers of the Nerves.

XXIV. ***The Pairs or Conjunctions of the Nerves are reckon'd to be Thirty Nine, with one Nerve that is not Pair'd.*** That is to ſay Nine pair ariſing from the Pith of the Brain, within the *Cranium*; and Thirty without ſide of the *Cranium*, proceeding from the Spinal Pith through the holes of the Vertebres, eight Pairs of the Neck, twelve of the Breaſt, five of the Loyns, and five of the *Os Sacrum*. To this number is to be added the Nerve that has no Pair, going forth at the end of the Spinal Pith, which *Fernelius* will have to be rather number'd among the Ligaments. But this Number differs from the Computation of thoſe who will have but only Seven Pair of Nerves within the *Cranium* according to *Galen*, whereas there are rather Nine, (*See lib.* 3. *cap.* 8) and ſo they number Thirty Seven Pairs, with one odd Pair.

As to the Devarications of the Nerves, they are innumerable, not to be deſcribed by all the Art of Anatomiſts, and therefore we ſhall only mention thoſe which are moſt remarkable.

CHAP. II.

Of the Nerves of the Neck.

OF the Nerves proceeding from the long Pith of the Brain, within the *Cranium* we have diſcover'd ſufficiently, *lib.* 3. *cap.* 8.

But from the Pith of the Spine ſeveral Nerves proceed, of which more at large *lib.* 3. *cap.* 7. of which Anatomiſts number ſo many Conjunctions, as there are wholes in the Vertebres out of which they proceed.

The Coats of the Nerves.

The Nerves proceeding from the Spinal Marrow, conſiſt of ſeveral little Strings, which tack'd together from the thin *Meninx*, make one Nerve, which the thicker it is, into ſo many the more little Threads it is divided, which appears upon the Diſſection of the Membrane. But leaſt the ſaid little ſtrigs, at their firſt egreſs, ſhould be parted one from another, firſt they are wrapt above with the thin *Meninx* call'd the *Dura Mater*, and no ſooner have they made their egreſs through the holes of the Vertebres, but they are bound about with a ſtrong fleſhy ſubſtance, like a Ligament.

The Nerves proceeding from the Marrow deſcending into the Spine, (where it uſes to be call'd the *Spinal*, or the *Dorſal* Marrow) according to the Order in which they deſcend from the Marrow, and divided into the Nerves of the Neck, the Back or Breaſt, the Loyns, and of the *Os Sacrum*.

From the Pith paſſing through the Vertebres of the Neck, proceed Eight Pairs; though others count but Seven, numbring the lowermoſt Pair among the Nerves of the Breaſt.

II. ***The firſt and ſecond Pair***, ſpringing out from the fore-part of the Marrow, not from the ſide, leaſt they ſhould be prejudic'd by the peculiar Articulation of the firſt and ſecond Vertebre, ariſe with a double beginning; the one between the hinder part

of the Head of the firſt Vertebre; the other between the firſt and ſecond Vertebre, at the ſides of the Denti-form'd Proceſs. But the firſt beginning of the Pair is diſtributed into the Muſcles reſting upon the Neck, and lying under the *Oeſophagus* or Benders of the Neck. The hinder beginning of it proceeds with a double diſſemination. Of which the ſlendreſt is diſtributed into the leſſer ſtreight Muſcles, and the upper oblique *Extenders* of the Head; the other is inſerted into the Beginning of the Muſcle raſing up the *Scapula*. But the *Firſt, and moſt ſlender beginning of the ſecond Pair*, making its egreſs at the ſide of the Denti-form'd Proceſs, is diſtributed into the Muſcles of the Neck, and waſts it ſelf in the Skin of the Face. The *Hinder Beginning*, burſting forth at the ſides of the Proceſs of the hinder Vertebre, is preſently after divided into two unequal Branches. Of which the *thicker*, tending toward the hinder Parts, and joyning its ſelf with the third Branch of the third *Pair* of the Nerves, crawls over all the hinder Muſcles of the Neck, and partly communicated to the Ears, aſcends the very Top of the Head, and there waſts it ſelf into the Skin. The *Other* which is more *Thin*, is diſtributed into the larger ſtreight and oblique Muſcles of the lower Part of the Head.

III. *The third Pair*, riſes in each ſide, between the Lateral hole, between the ſecond Vertebre, immediately after its egreſs is divided into two Branches. The foremoſt of theſe is again ſubdivided into four Stocks of which the *Firſt* runs out to the firſt Muſcle, of thoſe that bend the Neck, call'd the long Muſcle The *Second*, deſcending, and united with a Sprig of the *Fourth Pair*, ends in the Muſcles lying under the Gullet. The *Third* aſcending, and concurring with the thicker Branch of the Second Pair, vaniſhes in the Skinny Parts of the hinder Part of the Head. The *Fourth*, ſending forth Branches to the Muſcle extending the Neck, in the Tranſverſe Proceſſes at the end of the Neck and the raiſer of the *Scapula*, ſeated at the beginning of the Neck, terminates in the four ſquare Muſcle, drawing down the Cheeks. The *hinder Branch of this Pair* is inſerted into the ſecond Pair of the Muſcles extending the Breaſt.

IV. *The fourth Pair*, riſing between the third and fourth Vertebre, is preſently divided into two unequal Branches. Of theſe, the foremoſt and biggeſt is again tripartited into three little Sprigs. Of which the Firſt being joyn'd with another Branch of the Third, enters the firſt and long Pair of the Muſcles bending the Neck; the other is carry'd to the tranſverſal Muſcle, extending the Neck, and the firſt of the *Scapula*, called the *Cucular*. The third, ſlenderer then the reſt, being joyn'd with a little Sprig deſcending cloſe by the *Mediaſtinum* and *Pericardium*, together with thoſe little Sprigs conſtitutes the *Diaphramatic* Nerve. The *hindermoſt* and *leaſt*, proceeding backward toward the Spine, affords ſeveral Branches, to the Muſcles of that place, and thence is carry'd between the four ſquare Muſcle drawing down the Cheeks.

V. *The fifth Pair*, riſing between the fourth and fifth Vertebre, is alſo divided into two Branches, the foremoſt and the hindermoſt. The foremoſt ſends forth four little Sprigs; of which the firſt is carry'd to the Benders of the Neck; The ſecond, together with the Stocks of the fourth and ſixth Pair, and ſomtimes the ſeventh, when the Branch of the ſeventh is wanting, deſcending by the ſides of the Vertebres, along the fore-parts of the Vertebres, is inſerted into the middle of the *Diaphragma*, and therein conſtitutes the *Phrenic* Nerve. The third proceeds to the *Deltoides*, or Muſcle that raiſes the Shoulder, through the upper and outer-moſt ſeat of the Shoulder, and thence ſends forth little Branches to the *Cucular*, and Muſcle rearing the *Scapula*. The fourth, approaching the Neck of the *Scapula*, is divided into two Branches; of which the one is carry'd to the *Deltoides*, where it parts from the *Scapula*; the other which is ſomewhat thicker, is contorted toward the Spine, and is diſtributed in the ſame manner as the hinder part of the fourth Pair.

VI. *The Sixth Pair*, breaking forth under the fifth Vertebre, and being divided alſo into two Branches, when it has ſent forth a little Sprig to conſtitute the *Phrenic* Nerve, which being joyn'd with a little Branch of the fourth and fifth Pair, it forms, proceeding farther, is united with the ſeventh of the Neck, and the firſt Pair of the Breaſt, and then parts from them, but being again United, forms the Net-reſembling Fold, from whence the Nerves proceed which are carry'd to the Arm. The hindermoſt is carry'd to the hinder Muſcles extending the Head and Neck.

The

VII. *The ſeventh Pair* makes its Paſſage through the Common Hole of the ſixth and ſeventh Vertebres. The foremoſt and biggeſt Branch of this Pair, is united preſently after its Egreſs with the ſixth of the Neck, and firſt of the Breaſt, which we reckon the eighth of the Neck, and with the reſt, is carried the greateſt part of it to the Arm. The hindermoſt and leſſer Branch goes away to the Muſcles reſting upon the Neck, and the fourſquare Muſcle drawing down the Cheeks.

VIII. *The eighth Pair*, which ſome call the firſt of the Breaſt, coming forth between the laſt of the Neck and the firſt Vertebre of the Breaſt, is preſently ſlit into two Branches. The foremoſt and biggeſt is united with the ſeventh of the Neck, and the firſt Nerve of the Breaſt, and ſo is afterwards altogether diſperſed into the Arms. Except one Stock, which riſing at the beginning of it, is united with the Nerves aforeſaid, and carried into the Fore-parts as far as the *Sternon*, all the length of the firſt Rib of the Breaſt; affording alſo a little Sprig to the Subclavial Muſcle; then winding back upwards, terminates in the Muſcles riſing from the upper part of the *Sternon*, that is to ſay, the *Maſtoides*, *Sternon-hyoides*, and *Hyoides*; into which, nevertheleſs ſome Branches are tranſmitted from the ſixth Conjugation of the Brain, and the third of the Breaſt. However, from the ſame Branch ready to go into the Arm, another Ramification proceeds at the hinder Part, which enters the Muſcle poſſeſſing the Cavity of the *Scapula*. The hindermoſt and the leſſer, lyes hid under the Muſcles which grow to the Vertebres; from whence it ſends ſome Ramifications into the ſecond Muſcle bending the Neck, as alſo into thoſe which extend the Head and Neck; but deſcending about the Spine of the ſeventh Vertebre, it ſends forth little Sprigs into the lower Part of the firſt Muſcle of the *Scapula*, that is to ſay, the *Cucullar*, and of the third, or *Rhamboides*, and the *Upper Poſtic Serratus*.

CHAP. III.

Of the Nerves of the Breaſt or Back.

TWelve Pair ariſe out of the Dorſal Marrow, all which Nerves, after their Egreſs, are divided into two Branches, of which, the biggeſt is contorted toward the Fore-parts, the leſſer toward the hinder Parts.

I. *The firſt Pair*, riſing between the firſt and ſecond Vertebre of the Breaſt, is preſently divided into two Branches: Of which the foremoſt and biggeſt is united with the fifth, ſixth, ſeventh and eighth Pair of the Neck, and with them forms the Net-reſembling Contexture, from whence all the Nerves ariſe that are to deſcend to the Arm. This alſo ſends forth a Branch all along the Courſe of the firſt Rib, to the Sternon-bone, which conſtitutes the firſt Intercoſtal Nerve, and diſtributes little Twigs into the Muſcles, reſting upon the Breaſt. The hindermoſt and leſſer Branch is diſſeminated into the ſame manner as the hinder Branch of the eighth Pair of the Neck.

II. The ten following Pairs, are likewiſe divided into the foremoſt bigger Branch, and the hindermoſt leſſer: Of which, the foremoſt Branches being accompanied with as many Branches deſcending under the *Pleura* from the Inner Branch of the Nerve of the ſixth Pair, conſtitute the *Intercoſtals*; which, together with the Intercoſtal Arteries and Veins, are carried all the length of the Rib toward the fore-parts, through the Cavity in the lower and innermoſt Seat of the Ribs. But thoſe which belong to the true Ribs, proceed as far as the *Sternon*. But thoſe which belong to the ſpurious Ribs, are carried to the fore-parts of the *Abdomen* above the *Peritonæum*. From theſe ſeveral little Branches run out to ſeveral Muſcles; as to the External and Internal Intercoſtals, the two *Antic Serrati*, the broad Withdrawer of the Shoulder, and the Pectoral, which brings the Shoulder to; alſo to the firſt Pair of the Muſcles of the *Abdomen*, and the whole Skin of the Breaſt, and the Nipples of the Breaſt, to which they impart a moſt acute Senſe. The latter Branches haſten toward the Spine between the Muſcles growing to the

Vertebres, and ſend Branches both to them, the Muſcles riſing from the tops of the Vertebres, and the Skin of the Back. *Galen* obſerves, that the Nerves which iſſue from the baſtard Ribs, are bigger than thoſe which proceed from the Superior Ribs, and are always bipartited about the middle of the Ribs, make their Egreſs at one Part, and at the other crawl through the inner Rib. But we have obſerved that Diviſion not about the middle of the Rib, but preſently after they have made their Egreſs out of the Holes of the Vertebres.

III. *The twelfth Pair*, which others reckon to be the firſt of the Loyns, breaks forth between the laſt of the Breaſt, and the firſt of the Loyns, and is preſently divided into two Branches; of which, the foremoſt, which is the biggeſt, is inſerted into the fleſhy Appendix's of the *Diaphragma*, the obliquely deſcending Muſcles of the *Abdomen*, and the firſt of the bending Muſcles called the *Pſoas*; the Compreſſion of which, by the Stone in the Kidneys, cauſes a Numneſs in the Thigh on that ſide. From this Branch, that little Sprig derives is Original, which, together with the preparing Artery is carried to the Teſticles. *l.* 1. *c.* 22. Which *Veſalius*, *Plater* and *Laurentius* affirm to proceed from the firſt Pair of the Loyns, being our twelfth Pair of the Breaſt. The Hindermoſt enters the Muſcles of the Loyns, reſting upon the hinder Part of the Vertebres; that is to ſay, the longeſt, the *Sacrolumbus*, and the broadeſt withdrawer of the Shoulder.

CHAP. IV.

Of the Nerves of the Loins.

FRom the Spinal Marrow contained in the Vertebres of the Loyns, proceed five Pairs, which are bigger than the Dorſals, and divided into two Branches; of which, the four Branches are carried to the Muſcles of the *Abdomen*; the hindermoſt to the Muſcles of the Vertebres, reſting upon the Spines and nameleſs Bones, and afford ſome little Branches to the Skin inveſting the Loyns. The foremoſt being united at ſome diſtance, conſtitute that Fold from whence the Nerves proceed, that are to be ſent to the Thighs.

I. *The firſt Pair* makes its Egreſs between the firſt and ſecond Vertebre of the Loyns, under the *Pſoas* or *Ploas* Muſcle, and is carried with its foremoſt Branch to the ſecond Muſcle bending the Thigh, and the firſt Faſcial bending the Leg, as alſo to the Skin of the Thigh. With the latter, going forth from the *Abdomen*, it provides for the three *Glutæi* extending the Thigh, and the Membranous Extenſor of the Leg.

II. *The ſecond Pair* proceeds between the firſt and ſecond Vertebre under the firſt Muſcle bending the Thigh. The Fore-branch of this paſſing near the Ileon Bones, ſends forth two Stalks; one to the Knee and its Skin; the other long, which accompanies the *Saphæna*. The other turns backward and enters the Muſcles that cover the Loyns.

III. *The third Pair*, which is the biggeſt of the Lumbal Nerves carried under the ſaid Muſcle bending the Thigh and the Share-Bone, accompanies the Crural Vein and and Artery. *Columbus* writes, that there is a Branch extended from it to the Groin, *Scrotum* and Skin of the Yard; which *Bauhinus* however derives from the Pith of the *Os Sacrum*.

IV. *The fourth Pair* riſes between the fourth and fifth Vertebre; and its foremoſt Branch paſſes through the Hole between the Bone of the Hip, the Share-bone, and the *Ileon*, and ſends forth Branches to the two Muſcles that fling the Thigh about; as alſo to the Muſcles ſecond and third that ſend the Thigh and others to the Muſcles of the Yard; ſome believe that it ſends other Branches to the Neck of the Womb and Bladder. The hindermoſt goes away into the Muſcles and Skin that covers the Vertebres.

V. *The fifth Pair*, which ſome will have to be the firſt of the *Os Sacrum*, riſing between the laſt Vertebre of the Loyns, and the upper part of the *Os Sacrum*, is divided into two Branches; of which, the foremoſt is intermixed for the moſt part with the Nerves going to the Thigh, and ſends forth a little Branch near the inner Region of the *Ileon-bone*, to the Muſcles of the *Abdomen*, and the ſecond of the Thigh-benders. The latter is diſſeminated into the Muſcles growing from the *Ileon-bone*, chiefly

chiefly the greater *Glutæus*, and the Skin of the Bottocks.

CHAP. V.

Of the Nerves proceeding from the Pith of the Os Sacrum.

FRom the Marrow contained in the Cavity of the *Os Sacrum*, five Pairs proceed; which Nerves, before they take their Progreſs through the Holes of this Bone, are divided each into an inner and outer Branch, which go forth before and behind through the tranſverſe Hole.

The three innner and uppermoſt go away to the Thigh; the two lowermoſt to the Veſſels of the Bladder and Podex, alſo to the *Perinæum*, the Yard and *Scrotum*, and the Neck of the Womb.

The hindermoſt are diſtributed to the Muſcles poſſeſſing the hinder Seat of the *Ileum* and *Os Sacrum*; the firſt and ſecond Extenders of the Breaſt, the longeſt Muſcle of the Back and *Sacrolumbus*; the Bender of the Loyns, called the Holy Muſcle, the broad Muſcle withdrawing the Shoulder, and the three *Glutæi* which conſtitute the Buttocks.

The End of the Spinal Marrow, penetrating into the *Coccyx-bone*, ſends forth one Stock, therefore called the Pairleſs, which is firſt divided into two, then more Branches running forth to the Buttocks, Podex, and certain Muſcles of the Thigh. This Pairleſs Nerve, *Fernelius* reckons among the Ligaments.

CHAP. VI.

Of the Nerves of the Arm and Hand.

The Plexus retiformis.

FRom the Spinal Marrow through the Holes of the Vertebres, five Nerves are carried into each Arm, that is to ſay, from the fifth, ſixth, ſeventh and eighth Pair of the Neck, and the firſt of the Breaſt. Theſe Nerves preſently after their Egreſs are united with the foremoſt and larger Branches, which are preſently parted again, and again united, are a ſecond time ſeparated, and ſo form a certain Net-reſembling Fold, which proceeds under the Clavicle, at the Egreſs of the Axillary Vein and Artery. From which Fold, having at length freed themſelves, they deſcend to the Arm of their own ſide; yet ſo, that the true Original of either is uncertain, by reaſon of the foreſaid reiterated Implication and Extrication; nor can the Anatomiſts decribe it otherwiſe than by Conjecture.

I. ***The firſt Pair*** is produced with a double Branch from the fifth Pair; of which, the one is carried to the ſecond *Deltoides* Muſcle of the Shoulder, and the Skin that covers it. The other toward the Neck of the *Scapula*, and there is cleft into two Branches, of which, the firſt is inſerted into the *Deltoides*, where it riſes from the Clavicle. The latter enters the fourth Pair of Muſcles of the Hyoides-bone, or *Coracohyoides*; the other affords a Branch to the upper *Scapulary* and *Deltoides*, in the ſame place where the Spine of the *Scapula* riſes. This is carried through the upper part of the Shoulder, as the reſt of the Nerves are carried through the *Ala* to the Arm, and there are ſlit into many Branches.

II. ***The Second***, which is the thicker, and carried through the fore-part and middle part of the Arm, under the two-headed Muſcle, and affording little Branches to the two Heads of the ſame, as alſo to the Head of the longer Muſcle depreſſing the Hand, is divided below the bending of the Elbow into two Branches: Of which, the External and the ſlendereſt being carried along, together with a Branch of the *Cephalic*, through the External Seat of the

the Elbow, enters the first and second Internode of the Thumb. The larger Internal is divided under the median Vein into two Branches; of which, the Exterior proceeding obliquely under the Skin, after it has left the Vein, runs toward the *Radius* as far as the Wrist. The innermost being fastned to the inner Branch of the *Basilic*, and taking an oblique Course, is divided about the Elbow into two principal Branches; of which, one goes away to the Wrist through the Region of the *Radius*; the other through the Region of the Elbow, and having passed beyond that, vanishes in the Skin of the inside of the Hand.

III. *The Third*, before it comes to the Arm, throws forth a little Branch between the Muscle, withdrawing the Shoulder and the *Deltoides*; thence proceeding to the Arm under the two-headed Muscle, sends forth a little Sprig into the Head of the second, bending the Elbow. From hence descending with a Branch of the second Nerve, it approaches the inner Tubercle of the Bone of the Shoulder in the bending of the Elbow on the fore-side, which having past, it casts forth several little Branches, which being united with other little Branches from the fifth Nerve, carried through the hinder Region of the said eminency, are distributed into the Muscles possessing the inner Seat of the Elbow, and springing from the Internal Eminency of the Shoulder, *viz.* into the two Muscles of the Fingers, bending the External Internodes, and another that bends the third Joynt of the Thumb. From thence it casts forth another Stock, which descends between the said Muscles through the Radius toward the Wrist, and passing under the Transverse Ligament, sends forth certain little Sprigs to the withdrawing Muscle of the Thumb, and the other two bending the first Joynt of it. Afterwards, coming to the Hollow of the Hand, it is divided into three Branches; of which, the first gives two little Sprigs to the Thumb; the second, two to the Fore-finger; the third, one to the Middle-finger about the inner side.

IV. *The Fourth*, three times as thick as the rest, is carried through the Arm, deeply concealed among the Muscles, together with the Axillary Artery and the Basilic Vein. But entring the Arm, it sends forth upward and downward several little Sprigs into the Heads of the Muscles extending the Elbow, and the Skin investing the Internal Seat of the Elbow. Hence through the inner Hollowness in the Eminency of the Shoulder-bone, proceeding toward the hinder Parts, there it goes away into the Skin of the Arm, and descends from thence to the Wrist. Now the Joynt of the Elbow, it is divided into two Branches, which descend between the Muscles to the Wrist. Of which, the External being produced all the length of the *Radius*, and at the Wrist, on the outer side, passing the Transverse Ligament, is there divided into two Branches, of which, one is inserted with a double Sprig into the external Seat of the Thumb; the other partly into the Fore-finger, and partly into the Middle-finger. The Internal, stretch'd out all the length of the Elbow, sends forth several Ramifications. 1. Into the first Muscle, extending the Fingers. 2. Into the second Muscle, extending the Fingers. 3. Into the inner Muscle, extending the Wrist; hence it affords several Stalks in its Progress, to the three beginnings of the Muscles, deriving their Original from the Bone of the Elbow. What remains, terminates in the Wrist.

V. *The Fifth*, proceeding from the Inferior Part of the foresaid Net-resembling Fold, and joyned to the fourth, descends between the Muscles bending and extending the Elbow, and proceeds entire to the Internal Eminency of the Shoulder, and there, together with the third Nerve, sends forth Branches to the Muscles springing from that Eminency, and possessing the inner Seat of the Elbow. It also throws forth somewhat farther, between the Muscles bending the second and third Internodes of the Fingers, a little Sprig to the Hollow of the Hand, where it brings forth three Branches: Of which, the first being bipartited, enters the inner Part of the Little-finger; the second, being bipartited, enters the Ring-finger; the third proceeds to the External Seat of the inner side of the Middle-finger. Besides, this fifth Nerve casts forth another little Sprig from the outer side, all along the middle of the length of the Radius; which Sprig being again divided into three Branches, enters the External Part of the Middle, Ring, and Little-finger.

VI. *The Sixth*, which is sometimes added to the preceeding five, arises from the inner Part of the Net-resembling

bling fold deſcends through the inner ſeat of the Shoulder and Elbow, with many little Sprigs diſpers'd by the way to the neighbouring Skin. But when it touches the Internal Eminency of the Shoulder Bone, it is divided into ſeveral Stalks, which being accompanied with the branches of the Baſilic Vein, when they come to the Wriſt vaniſh under the Skin.

CHAP. VII.

Of the Nerves of the Thighs and Feet.

THere are four Pair of Nerves that deſcend to the Thighs, which riſe from the ſeven Pairs deſcending from the Spinal Marrow; that is, the four lower Pairs of the Loyns, the three upper Pair of the *Os Sacrum* which being all intermix'd at their beginning from the Net-reſembling fold, from which on each ſide the four aforeſaid Nerves iſſue differing both in thickneſs and courſe. The firſt and third, becauſe they do not ſtir out of the Thigh, are ſhorter and more ſlender, the ſecond longer and thicker is carried through the middle of the Thigh and extended to to the Leg. The fourth much thicker and longer then the former, is carry'd through the Thigh and Legs to the Tops of the Fingers. Of thoſe the three foremoſt appear before the Fourth behind.

I. *The Firſt*, riſes from the upper part of the Net-reſembling fold, where the Second Nerve of the Loyns unites with the Third, and enters the two Muſcles extending the Thigh, and its Skin; diſtributing little Branches to the firſt of the Leg-benders, and to the ſecond and third extending it, and terminates above the joynt of the Knee.

II. *The Second*, riſing from the ſame Fountain, next under the firſt, goes away with the Crural Arteries and Vein through the Groyns to the Thigh, and enters its inner and foremoſt Muſcles, diſtributing little Branches alſo to the adjoyning Membranes and Skin, and ſending one remarkable Branch to the Foot. *Laurentius Spigelius*, and others erroneouſly aſſert, that this Nerve is united with the *Saphena* Vein, for which reaſon it is ſomewhat dangerous to open this Vein; whereas it takes its courſe all alone without any Companion.

The Third, riſing from the *Fold* preſently under the Second, and carry'd about the ſecond Muſcle bending the Thigh.

IV. *The Fourth*, which *Bartholin* has obſerv'd double both at its beginning and Progreſs, and which is the thickeſt, dryeſt and ſtrongeſt of all the Nerves in the whole Body, form'd out of the loweſt of the Loyns; and the three upper Pairs of the *Os Sacrum*, after it has provided for the Thigh and the Skin of the Buttocks, ſends forth little Branches to ſome Muſcles of the Thigh, Leg and Foot. Thence deſcending farther with its Trunk, at the bending of the Knee in the Ham, it is divided into an outer and inner Branch. Of which the outermoſt, which is the ſlendereſt, is produc'd to the Ham, the outer Parts of the Foot, *Perinæan* Muſcles and the Internal part of the *Malleolus* by the way affording many little Sprigs to the Skin; The innermoſt, which is the bigger, all along the length of the Leg diſpatches other Sprigs to the Muſcles of the Feet and Toes, to the great Toe, the Sole of the Foot, and the Skin of the Calf, and to both the lower ſides of the Toes. Wherefore all the Nerves, carry'd below the Knee to the Nerves, proceed from this Crural Trunk except that Branch which deſcends from the ſecond Pair next the Heel.

We have not given any particular deſcription of the Cutaneous Nerves, which are only little Branches ſent to the Skin from the Nerves adjoyning, whoſe productions are only conſpicuous, but their particular Deſcriptions are impoſſible, and therefore never undertaken.

THE

THE NINTH BOOK OF ANATOMY. Concerning the BONES.

CHAP. I.

Of the Bones in General.

MAny Anatomiſts begin their Anatomical Deſcriptions from the Bones, in imitation of *Galen*; becauſe the Bones are the Eſtabliſhment of the whole Body, without which the reſt of the Parts could not ſubſiſt. For Nature ſays *Galen* imitates the building of Ships; adapting the Vertebres in the place of the Keel, to which ſhe afterwards fits the Ribs, Beams, Planks, and ſides, and the reſt of the Wood-work. And therefore *Galen* begins with the Bones preſuppoſing them to be found before the other Parts as being the Ground-work upon which all the other Parts muſt ſubſiſt. But we diſlike that method for more pregnant reaſons. 1. Becauſe the Bones are not form'd before the other Parts, but at the ſame times, *lib.* 1. *cap.* 29. 2. Becauſe they are later compleated then the other Parts. 3. Becauſe the Bones are not the neceſſary baſis for a Ground-work at the beginning, until they have obtain'd a convenient hardneſs, which they have not at the beginning, but ſome Months after Conception and the Formation of the whole, nay many are wanting till after the Birth. 4. Becauſe the Bones cannot be ſhown, till all the Parts annexed are remov'd, and the Bones be laid bare. 5. Becauſe all the ſofter Parts, are lyable to Putrefaction, which the Bones are not, and therefore neceſſarily the ſoft Parts are firſt to be demonſtrated; as leading the neareſt way to inſtruction and dueneſs of Method. And therefore we have obſerved this courſe; adding in the laſt place the Griſtles and Ligaments which faſten the Bones together.

But here you'l ſay, that the Knowledge of the Bones is beneath a Phyſitian, and only fit for Chyrurgions whoſe manual Operations are only proper, in Fractures and Luxations of the Bones. But in regard it is neceſſary for a Phyſitian to underſtand the whole Body of Phyſic which conſiſts but of two Parts, knowing, and curing, and that Curation is perform'd by Dyet, Chyrurgery and Pharmacy, a Phyſitian certainly ought to have the perfect knowledg not only of the whole Body of Man, it's health and diſtempers, but alſo of the Remedies, and conſequently of Chyrurgery, which is certainly the moſt Noble and Antient Part of Medicinal Cure; and

And although a Physitian taken up with more profound Speculations, may not practise Chyrurgery, yet the Knowledge of it is absolutely necessary for him, that he may be able to perform the Office of a Chyrurgion, where a Chyrurgeon is not to be had; and that he may be able many times to direct a Chyrurgeon in his Operation, to which purpose, the Knowledg of the Bones is of great importance. For which reason, *Hippocrates*, the Father of all Physitians, recommends it to his Son *Tessalus*. And for the same reason, *Galen* would have all that read *Hippocrates*'s Books of Fractures and Luxations, to be perfectly skill'd in the Skeleton.

The Name. I. *The Bones, by the Greeks called* ὀστέα *from* ἵστημι *to stand, because the whole Structure of the Body stands by means of Bones; according to that of* Hippocrates, *the Bones afford Stability, Streightness, and Form to the whole Body.*

Definition. II. *The Bones are similar Parts, very hard, very dry, and destitute of Sense, colder than all the rest of the Parts, framed for the support of the whole Body.*

They are called similar, not that they are absolutely, but because they appear so to the Sense, nor can be easily divided into other Parts. For the clearer Explanation of which, *Spigelius* distinguishes between *Simile* and *Similare*, which he says differ as much as the Denominative from the thing from whence the Denomination is derived.

Generation. III. *The Bones are generated in the Womb out of the thicker and more tartareous, or earthly Part of the Seed, nourished with the tartareous Particles of the Blood, and moistned with the marrowie Fat.*

Marrow. IV. But the marrowy Fat called *Marrow*, is not of the same sort in all the Bones; for that in the large Hollownesses of the larger Bones, it is very oyly and Fat, yet of a Colour somewhat inclining to red; but in the Cavities of the lesser Bones it is white. But in the spungy Bones the Marrow is less thick and unctuous. The Marrow is generated out of the Blood thrust forward into the inner Parts of the Bones through the little Arteries, of which, more by and by. Two things are here to be noted. 1. That the Marrow is plainly destitute of feeling; though formerly *Paræus* thought otherwise. 2. That it is not enveloped with any Membrane in the Cavity of the Bones. By which Mark, *Hippocrates* distinguishes it from the Spinal Marrow. *The Spinal Marrow*, says he, *is not like the Marrow which is in the other Bones, for only this has Membranes, which the other Marrow has not.*

This Marrow is very useful to the Bones, for that the tartareous Particles, when they are near to fixation, quickly congeal into an Icy Hardness; so that the Bones would become very brittle, and never grow to their due Magnitude, unless that marrowy Fat penetrating the whole Bone, did not temper and soften the extream Hardness of the tartareous Particles, and so provide that in the Growth of the whole Body that the tartareous Particles do not separate, but still continue new Intermixtures with fresh Particles, till the Bone have attained its Perfection. Which growth surceases, when by reason of the increasing Heat of the Body, these Particles are so dryed up, that they can no longer be mollified by the marrowy Fat; nor extend themselves. Whence it comes to pass, that the more the heat of the Body encreases, the less the Body shoots out in length; because the bones which are the Basis's and Props of the Body become more and more dry and hardned, and the Marrow grows thicker and less moist. Hence it comes to pass, that Infants grow much in a short time, Children less, and Youth less than they, and aged Persons never grow at all, by reason their Marrow is less in quantity, and less moist and oyly; and their dryness of their Bones causes them to be more brittle and easily broken.

Now the Tartareous Particles are separated from the Arterious Blood by the mixture of the Animal Spirits, which that they flow in great quantity to the *Periostea*, the quick Sense of the *Periostea* testifies, *Vid. l.* 3. *c.* 11. After which separation, the Particles are opposed to the Bones by the help of the marrowy Fat which moistens them.

The Vessels. V. *But the Blood flows to the* Periostea *and inner Parts, through the Arteries, and the less useful remainder flows back again through the Veins.* To which purpose, those Vessels not only terminate with their Extremities in the *Periostea*, but also penetrate the

Bones themſelves, and pour forth Blood into their innermoſt Concavities, to be changed into Marrow, which is the proper Nouriſhment for the Bones. And though their Ingreſs is not diſcernable in all, yet in the larger Bones of the Shoulder and thigh, it is apparent, where the Cavities are perſpicuouſly pervious, as far as the Marrow, affording paſſage to the Arteries. Beſides, their Ingreſs into the Bones, appears by the Sanguinous Juice which is form'd in the *Deplois*, the middle ſpungy Table of the Skull, and in the inner ſpungy Subſtance of the Ribs of Infants, and many other Bones, which could never come thither through any other Channels. To this, add the Obſervation of *Spigelius*, who at *Padua*, in a great Rottenneſs of the Shin-bone, ſaw the ſubſtance of the Bone perforated by the Arteries, at what time, *Plempius* was preſent by his own report. I my ſelf, in the Year 1665. had a young Man in cure, whoſe Shin-bone in the Fore-part was corroded with an extraordinary Rottenneſs. After I had taken away the Fleſh about it with the *Perioſteum*, I perceived in the inner Cavity, which reached to the Marrow, a little Artery beating very quick; whereas no Man could dream of an Artery in the hardeſt Place of all the Bone; nor was the Artery continuous with the Fleſh, for that was taken away, and yet the Pulſe remained for many days in the inner rotten Cavity of the Bone. Which makes me believe that theſe Arteries are ſeldom conſpicuous in the hard Part of the Bone, when Men are at their full Maturity; perhaps becauſe the Arteries being preſſed by the hardneſs of the growing Bone, at length vaniſh all together; and where they are ſomewhat bigger than ordinary, thoſe People, by reaſon of ſome ill Humors in their Bodies, are eaſily ſubject to Rottenneſs in their Bones, by reaſon of the ſharp and corrupt Blood poured into them through the Arteries, which by the Infuſion of good Blood, when Bones are broken, afford Matter for Calloſity. However, this ſhews *Platerus*'s Error, denying that the Arteries never enter the Bones; and how much *Galen* was in the Right, who allows to every Bone a Blood-bearing Veſſel, bigger or leſſer, according to the Proportion of the Bone.

Now that the Bones harden by reaſon of the increaſing Heat, is plain from thoſe Men who are born and bred in hot Countries, for by reaſon of the great external Heat, and the Internal ſooner increaſing within, they are generally ſhorter, dryer and leaner, the Humidity of the Body being ſooner waſted. On the other ſide, they who inhabit cold and moſt Countries, and eat and drink plentifully, they grow tall, by reaſon of the ſlower increaſe of their Heat and Drought; as we find by the *Danes*, *Norwegians*, *Muſcovites*, &c. Now that Growth is hindred from the Increaſe of Heat and Drought, is apparent from hence, that Ladies, to prevent their Lap-dog Puppies from growing, take away their Milk and moiſt Food, and feed them with Wine or Spirit of Wine, which cauſes a quicker increaſe of the natural Heat, and renders the Alimentary Blood more dry and ſharp; by which means, the Bones being dry'd more ſuddenly, the Puppies ceaſe to grow.

The efficient Cauſe.

VI. *The efficient Cauſe of the Bones, is the vivific Spirit ſeated in the Seed, which* Galen *calls the Oſſific Faculty, diſpoſing the more Tartareous Parts of the Seed, for the Materials of Bones.* Theſe Spirits therefore may be ſaid to be the Eſſential form of the Bones, which ſome Phyſitians will have to be their cold and dry Temper; but *Ariſtotle* will have it to be the ſame. *Rolfinch* finding that the Bones were ſtill the ſame in dead Bodies as in living, believes the formal Cauſe of the Bones to be no more known than the formal Cauſe of a Stone. But what if we ſay, that the vivific Spirit is the Form of living Bones, and their cold and dry Temper, together with their own Conformation the Form of living Bones.

As for their accidental Form it is their Shape and Figure, whether round, flat, ſtreight, or crooked, according to their various uſe.

The time of their Formation.

VII. *As to the Time of their Formation*, *Aquapendens* believes, that the Bones are firſt generated among the other Parts, reſting upon *Galens* Argument at the beginning of the Chapter. *Harvey* believes them not to be ſooner generated than other Parts, of which, many turn into Bones of the Birth, as in the Teeth. Neither is there any thing to be ſeen in the firſt Principles and Beginnings of Formation, but a ſoft, ſlimy, gluteous Subſtance, that approaches no way to the Conſtitution or Nature of Bones, which Conſtitution it acquires afterwards by degrees.

VIII. *The*

Their Use. VIII. *The end of the Bones, when arrived at their just Hardness is no Action but a Use, for no Bone exercises any Action.* This end is either common or particular; common to be the Props and Supports of all the Parts. Their particular Use is various, to defend many principal Parts and Bowels from external Injuries, to afford a secure Passage for others, as in the Spine; to bind the Laxity of the Joynts, as in the Knee-pan, *&c.*

The Difference. IX. *The Differences between the Bones, according to* Galen, *are three.* In respect of their Bulk, some larger, some little; in respect of their Cavity, some hollow, others solid; in respect of what they contain, some containing Marrow, others none. The other differences we shall shew as we go along.

Their Substance. X. *Their Substance is whitish and hard, though harder or softer according to the difference of Age,* not altogether dry in living Creatures, but bespread with a certain Fat and viscous Moisture, which the more plentifully it abounds in the Bones, the more tenacious they are, and the less brittle, and being broken, they the sooner unite together again, by means of the brawny Callosity.

Callus. XI. I say that they unite by means of the brawny Callosity; for that the Bones being taken away, never grow again, according to that Maxim of *Hippocrates, A perfect Bone, or Gristle, or Nerve, or any thin Particle of the Preputium, neither grows again nor unites.* That is, it does not unite without a *Heterogeneous* Medium. But the Callosity, by means of which, broken Bones unite, by degrees hardens and becomes bony in such a manner, as if it were a real Bone. This *Lindan* seems to have observed, where he says, that in Children some Bones are consolidated together without the help of any Callosity; for proof of which, he produces the Example of a *Boy of six years old, that broke his Thigh-bone, the Fragments of which, being sequestred by Art and Nature, there happens in the middle of the Bone, a boneless Space of about four Thumbs breadth. This was at length so filled up by the rest of the Parts of the Bone insensibly increased, and at last united together, that you could not tell where the Bone had been wanting, or that the Fracture had done any harm.* I remember something like this Story in a Person full grown. In the Year 1655. a Miller of *Nimmeghen* falling from his Mill, broke his Leg with a Button in the middle, with that violence, that the upper Part of the Bone boaring the Flesh, stuck in the Ground, which not only deprived it of the Flesh, but of the *Periosteum.* My self, with three Chyrurgeons more, were of Opinion, the Leg was to be cut off, there being no hopes of Cure: But one of the Chyrurgions being old and experienced, resolved first to cut of that part of the Bone which was bereft of its *Periosteum,* about the breadth of two Fingers: So said, so done, and then the Chyrurgion extended the Leg to its first length, and splintered it up all alike, dressing and cleansing the Wound every day; in a short time there grew a *Callus* from each end of the Bone, which at length uniting, grew into a bony hardness, and the Wound being cured, retained its due length, so that you could not perceive the Bone to have been taken away by any limping of the Patient afterward; which Cure proved the more successful, because there was no great Artery or Vein broken, and the Blood which flowed out of the small ones easily stopped by the first Ligature. From whence it is apparent, that broken Bones do not unite but by means of the *Callus.* As for the Bones of Infants, that unite and consolidate without the help of any *Heterogeneous Medium,* this is to be said, that in New-born Infants, many Bones have not attained their due hardness, but are as yet soft and flexible like Membranes, whereas really they appear to be such as when they have acquired their Hardness; and such are the Bones of the *Bregma* in Infants, of the hinder Part of the Head, and the nameless. Bones, which are still Bones, though they have not attained their due hardness, which being afterwards acquired, they become absolute Bones.

XII. *Many Bones, as those of the Thigh, Shoulder, Leg,* &c. *have a remarkable Concavity, the Domicel of much Marrow.* Others, as of the *Cranium* and Ribs, *&c.* have only small and obscure little Cells, fill'd with a sanguineous and marrowy Juice, necessary for their Nourishment. But these Cavities are so small, that they can either be hardly, or not very plainly discerned, and then those Bones are said to be solid, as the Bones of the Nose, the little Bones of the Wrist and Foot, *&c.* *Cavities.*

which without queſtion are furniſhed however with ſome ſmall Poroſities, though not manifeſtly conſpicuous.

In the Superficies of the Bones are to be conſidered Cavities and Prominences, made for the Convenience of the Joyntings, the Inſertion of the Tendons, of the Muſcles, Ligaments, &c. The Cavity, if it be deep, and receive the Head of another Bone, as in the Iſchion-bone, is called κοτύλη; if ſuperficiary, as in the Knee, γλήνη and *Sinus*, or a Hollowneſs. The Proceſſes which occur at the top of the Hollowneſſes like Lips, and moſt conſpicuous in deep Hollowneſſes, are called ὄφρυες, in Latin, *Labra* and *Supercilia*, Lips and Brains.

A Prominence. XIII. ***A Prominence is either round, as in the Head of the Thigh-bone; or long, as in the Stytoides; or hollow, as in the*** Scapula-bone. The round Prominence is called the Head, and if it be low and depreſſed, is called *Condilus*.

A Prominency is twofold, *Apophyſis* and *Epiphyſis*.

Apophyſis. XIV. Apophyſis, *in Latin* Proceſſus *or* Proceſs, ***is the continuous Part of a Bone, manifeſtly bunching out beyond the flat Superficies, for the more commodious Inſertion of the Muſcles, Tendons, and other Parts***; of which Proceſſes, there are many in the Vertebres of the Back, alſo in the lower Jaw and Scapula.

There is another ſhort *Apophyſis*, as in the Bones of the Fingers; and another long, and that either ſharp pointed, or ſimply long, variouſly named, according to the Figure which it reſembles, as *Styloides*, *Coracoides*, *Odontoides*, &c.

Epiphyſis. XV. Epiphyſis, *or Appendix, is a Bone growing to a Bone, like an Addition, by ſimple and immediate Contiguity*, and that by the Inlet of ſmall Heads or Boſoms, like a *Gynglymos*, though without Motion.

The Subſtance of the *Epiphyſis* in Infants new Born, is thin and griſtly, in Men of ripe Years it hardens into a thin and ſpungy Bone, and ſo in progreſs of time, is united with the Bone, as if it were an *Apophyſis*, and were one continuous Bone, ſo that it cannot be ſeparated again, unleſs by long maceration and boiling, if the Party were young. But it is no where more ſoft and weak than about its Connexion, for there as ſpungy as a Pumice Stone, it is furniſhed with many little Cels: But it has no remarkable Cavity containing Marrow; only a certain marrowy Juice in its porous little Cells, for its own Nouriſhment. But it is broader than the Bone it ſelf, and for that reaſon, renders the Articulation the ſtronger.

Whether Bones have Senſe? XVI. ***The Bones are deſtitute of the Senſe of Feeling***; neither are they furniſhed with any conſpicuous Nerves, except the grinding Teeth; but without ſide they are wrapt about with a thin Membrane very quick of feeling, that is to ſay, a *Perioſteum*, which becauſe it immediately adheres to the Bones, and is cruelly pain'd upon any Diſtemper, hence that painful Senſation is improperly attributed to the Bones; not that the Bones are affected, but the *Perioſtea* that lye next the Bones and the adjoyning Membranes. However the Teeth are deſtitute of *Perioſteums*, after they make their Egreſs out of their proper Seats; as alſo the little ſeſamoid Bones, the four little Bones of the Ears, and the ends of the Bones conſtituting the Joynts, to prevent their being pain'd by overmuch Motion and Colliſion.

Nicholas Maſſa relates an unuſual accident, that he ſaw an ulcer'd Thigh the Bone of which, after the *Perioſteum*, was ſcraped off, felt an extraordinary Pain, that it would hardly endure to be touch'd; nay, that he boar'd the Bone, and that there was within a moſt cruel Senſe of Pain, which, as he ſays, he therefore ſet down in Writing, that Anatomiſts might obſerve whether any Senſation of the Nerves penetrated to the Bones: From which Obſervation, ſome conclude, that ſome of the Bones, if not all, are endued with the Senſe of Feeling: But rather we muſt believe, that that ſame Corruption of the Bone being freed from its *Perioſteum*, extended it ſelf farther to thoſe Parts of the Bone which were not yet covered with a *Perioſteum*; and thence, by the Motion of the Bone laid bare, there might be ſome Pain in the Parts adjoyning to the *Perioſteum*, ſtill remaining covered; which Pains, I have often obſerved in my Practiſe, which were cauſed by the Motion of the Particles without Senſe, but really proceeded from the next adjoyning ſenſible Parts.

Againſt this Opinion of ours, there is an Objection raiſed from the Words of *Avenzoa*, who argues thus. *The Bones participate of the Rational Soul, and are nouriſhed, therefore they are ſenſible; for there is, according to* Ariſtotle, *both*

both a vigitative and a ſenſible Faculty in every thing that is rational, as in a Pentagon, *a Triangle and a Square; therefore there muſt be either two Souls in the Bones, or of neceſſity they muſt be ſenſible. Moreover, if they were not endued with the Senſe of Feeling, the greateſt Part of Animals would not differ from Plants. Laſtly, if the vital Spirits could flow into their Subſtance without the help of the Arteries, much more eaſily the Animal, which is much more ſpirituous, without the aſſiſtance of the Nerve.* Which Arguments, ſome have improved ſo far, as to deny any Obtuſeneſs of Senſe, but all quickneſs of feeling to the Bones. But theſe Arguments fall to the Ground, being ſeriouſly examined. For the conſequence of the firſt does not follow, *where there is a Soul and Nutrition, there is Senſe*: for there is a rational Soul and Nutrition in the *Carotides*, in *Cataleptics* and *Apoplectics*, but no Senſe.

Nay, the contrary to this is manifeſt in Brutes, which are quick of Senſe, though deſtitute of a Rational Soul. Moreover, a Rational Soul operates variouſly, according to the diverſity of the Organs; in the Eyes, it cauſes Sight; in the Membranes, Feeling; in the Muſcles, Motion; and there all the Parts that want the Senſe of Feeling, are not to be proſcribed out of the Juriſdiction of the Soul; otherwiſe the *Parenchyma's* of the Bowels, the Fat, and other Parts muſt be exil'd. A Man differs from Plants, in that he feels both Pain and Pleaſure; but hence it does not follow, that all his Parts muſt of neceſſity be ſenſible; it is enough that a Man has thoſe ſenſible Parts which the Plants have not. For becauſe a Man differs from Plants in ſeeing, does it follow that all his Parts muſt ſee? But laſtly, Experience teaches us, that all the Bones are not ſenſible of feeling. For we have often trepann'd and fil'd the Skull and Bones, and burnt them with red hot Inſtruments, without any Senſe of Pain; ſo that if you blind-folded the Patient, he knew nothing of the Operation. Thus *Scaliger* writes, that he has pulled Bones out of his own gaping Wounds without any pain.

The Number. XVII. *The Number of the Bones is not the ſame in all Ages.* For in Infants and Children they are more, which as the Heat encreaſes, unite and become fewer, as the Bones of the *Sternon* unite into one or three; the Share-bones, Hip-bones, and Ilion-bones into one, *&c.* Nor is there always the ſame Number at the ſame Age. For ſometimes one Rib is either ſuperfluous or wanting of each ſide: Sometimes the Vertebres of the Neck and Back; as alſo the Bones of the Thighs unite into one. Sometimes you ſhall find one Vertebre added to the Vertebres of the Loyns. As was obſerved in a Skeleton preſerved by *Antony Polt* of *Utrecht*, wherein there were ſix Vertebres of the Loyns. Laſtly, Anatomiſts vary in the Computation of the Bones. Some computing *Epiphyſes* among Bones, and others reckoning in the *Seſamoids*.

The Qualities. XVIII. *The Qualities of the Bones conſiſt in their Subſtance, in thoſe things which follow the Subſtance, and in the Accidents.* Their proper Temper compleats the Subſtance of the Bones, as being that which gives them their Being. Hardneſs and Colour follow Subſtance. The Accidents, are Bigneſs, Figure, Number, Situation and Connexion. From theſe three Qualities, proceed the Judgment of the Conſtitution of the Bones, whether entire and well, or endamaged and ill conſtituted. Bones in living Creatures, ſound and well conſtituted, ought to be hard, wrapt about with a *Perioſteum*, whitiſh, not abſolutely dry, but ſomewhat unctuous; their Subſtance alſo ought to be equal and continuous, and their Figure proper; otherwiſe they are diſeaſed and out of order.

CHAP. II.

Of the Conjunction of the Bones.

Symphiſis. THE Bones are faſtned one to another, either for Reſt or Motion. Connexion for Reſt is called Coalition, and is a firm Natural Connexion of the Bones without Motion, when two Bones are ſo united one within another, that they ſeem to be one Bone.

I. *Symphyſis is twofold, real, and not real.* Real, is when two Bones harden and unite without any manifeſt Heterogeneous Medium; thus the Chin or lower Jaw conſiſts of two Bones, united without any manifeſt Heterogeneous

neous Medium, and this is done three manner of ways.

Syneurosis. II. 1. *By* **Syneurosin,** when the Bones are joyned by a Medium that seems to be nervous or membranous, as in Infants, the Bones of the Skull, the name-less Bones, and Bodies of the Vertebres cohere together. I say, *seems to be*; because that Medium is not really nervous or membranous, but is truly bony; but such as has not yet acquir'd a perfect hardness; such as are many Bones of the Birth in the Womb, till the fourth Month after the first formation.

Synchondrosis. III. 2. *By* **Synchondrosin,** by the means of some Gristly interceeding Medium, as the Share-bones are united one with another, and the *Os Sacrum* with the Bones of the Hip.

Syssarcosis. IV. 3. *By* **Syssarcosin,** when the Conjunction is made by means of the Flesh, as that of the Teeth in the Gums.

Spigelius rejects *Syneurosis*, and instead thereof, sets up three other sorts of Coalition: *Syndesmosis*, when the Bones are bound together by means of a Ligament. *Syntenosis*, when they are knit together by means of a Tendon; and *Synemeusis*, when the Conjunction happens by means of a membrane.

Now the reason why some Bones unite without a Medium, and some not, is given by *Galen*. Bones that are hard, solid and thick, require a Medium to to unite them. For those things which differ much one from another, as hard and soft, cannot be united but by a Medium; soft with soft easily unites, but hard with hard cannot unite, unless something intervene to bind both together.

Articulation. V. *For Motion, Bones are joyned together by Articulation*; which Composition consists in Contiguity, and the Connexion is for the most Part made by the Ligaments; and either it is to cause a conspicuous or a less violent Motion.

Diarthrosis. VI. *In order to a violent Motion, the Bones are joyned by Diarthrosis*, that is, by a loose Articulation that has an evident Motion. And this is threefold.

Enarthrosis. VII. **Enarthrosis,** when the great Head of the Bone, protuberant from the long Neck, enters the profound Cavity or *Cotyle*, as in the Articulation of the Thigh Bone, with the *Ischion*.

Arthrodia. VIII. **Arthrodia,** when the lesser Head of the Muscle protuberant from the Neck, which is not so large, is inserted into the superficiary Cavity, and such is the Articulation of the Shoulder-bone with the *Scapula*.

Ginglymus. IX. **Ginglymus,** when one Bone with one or two Protuberances enters the Cavity of another Bone, and also possesses the Cavity into which it receives the Protuberances of the other Bones, as in the Bone of the Arm and Shoulder.

Gyngliſm happens three manner of ways.

1. When the Bone is received by one Bone, and receives the other.

2. When one Bone receives, and is received by another which it does not receive, as in the Vertebres.

3. When Articulation is made after the same manner as of a Wheel to the Axle; as is the Articulation of the first Vertebre of the Neck, with the second.

Synarthrosis. IX. *For slow Motion or Rest, the Bones are joyned by Synarthrosis*, which Articulation, has but little Motion, or none at all, unless upon necessity.

The Conjunction of the Bones for slow Motion, is threefold.

1. *Enarthrosis* in *Synarthrosis*, as between the Bone of the Heel and the *Astragalus*.

2. *Arthrodia* in *Synarthrosis*, as between the Cyboid-bone, and the Bone of the Heel; the Bone of the Wrist and *Matacarpus*.

3. *Gynglymus* in *Synarthrosis*, as between the Bone of the Heel and the Ancle.

Synarthrosis is not moved of it self to rest, unless great necessity require, which moves the Parts not subject to arbitrary Motion, without drawing them one or t'other way.

Suture. XI. 1. *The Suture*, when the Bones are so unequally joyned together, as if they were sowed on.

Harmonia. XII. 2. **Harmonia,** which is a Conjunction of the Bones by a simple streight, oblique or circular Line, as in the Bones of the upper Jaw and Nose.

Gomphosis. XIII. **Gomphosis,** when the Bones seem to be driven in like a Nail, as the Teeth into the Jaws.

CHAP.

CHAP. III.

Of the Cranium *in General.*

Skeleton. I. *THE whole Frame of all the Bones in the Body of Man adhering together, is called a* Skeleton, *from the* Greek, σκελλεῖν, *to dry up, because in dry'd Bones such a Conjunction is made by Art.*

This Conjunction is either of the Bones of grown Persons, or of Infants.

The Skeleton of grown Persons is divided into the Head, Trunk and Joynts.

The Head is all that which is set upon the Neck, and is divided into the *Cranium* and Face.

The Cranium. II. *The* Cranium *is globous and round, withinside the Concave bony Part of the Head, containing the Brain*; by some called *Calva* and *Calvaria*, the Skull or Scalp.

The Face. III. *The Face is that Part of the Head which is extended between the Fore-head, Ears and Chin.*

The Figure of the Skull. IV. *The Figure of the Skull is oblong, protuberant before and behind, and depressed on both sides.* Whatever Figure deviates from this is vitious, and the more it deviates, the more vitious it is.

But here arises a Doubt, whether the Head shapes the Brain, or the Brain the Head? *Hippocrates* says, the Bones give the Shape to the Body. *Galen* writes, that Nature, in imitation of the Bones, forms all the other Parts in a living Creature. Others add, that the House is first built and form'd for the Person that is to inhabit it, and that the softer is more easily shaped by the hard, than the hard by the soft. Which Reasons so far prevailed with *Arnold Senguerdius*, that he subscribed to it. On the other side, *Galen* teaches us in several Places, that the Brain shapes the *Cranium*, not the *Cranium* the Brain, which seems to us the more rational Opinion. 1. Because the Brain was not made for the *Cranium*, but the *Cranium* for the Brain. 2. Because the House is never made before the Person, for whom it is designed, but is generally built by the Person that is to inhabit it. Thus the Heart is conspicuous before its Domicil the Breast; in the salient Point, in the Bubble of an Egg, after the Hen has sate some few days. 3. Because the Brain in an Embrio is as soft as the Brain it self, as being altogether Membranous, so that it is easily and naturally shaped according to the Figure of the Brain, as the Membranes take their Shapes in other places from the Parts contained; nor is there any necessity that the Hard should be shap'd by the Soft, because that when it is figur'd, it is not soft, but after it is shap'd, it grows hard by degrees. 4. Because the Wrinkles which are imprinted into the insides of the Skull, and which receive the more eminent Veins of the hard *Meninx* and other protuberances of the Brain sufficiently shew, that they were not furrowed in the harden'd Brain, but while the Birth was in the Womb, by the Protuberances of the Brain and Veins, making an Impression in the soft and membranous Substance of the Skull.

The Substance. V. *The Substance of the Skull in the Embryo, is altogether Membranous, and in new-born Infants, for the most part bony, but so soft, that it will yield to compression, especially at the upper part of the Head about the Sutures, where at that time it has hardly attained its due bony hardness, but is extraordinary thin, to the end the plentiful Moisture of the Brain abounding in Children, may the more commodiously exhale. Afterwards, for the greater security of the Brain, it grows hard by degrees, like other Bones, but in the middle, remains spungy, for the more easie passage of the Vapors.*

The Thickness. VI. *The thickness of it is various, according to the variety of Ages*; nor is it always the same in the same Age. For the diversity of Regions also causes a great difference. Thus *Herodotus* relates, that the Skulls of the Persians are very thin and brittle, and easily crack'd; those of the Egyptians very strong and thick, hardly to be broken with the fall of a large Stone. Moreover the Skulls of tender People, are less thick and hard than in labouring Folks, enur'd to Hardship. The cause of which *Carpus* believes to be, for that tender People always keep their Heads cover'd from heat and cold; but Husband-men, Sea-men and the like are used to go bare-headed Winter and Sum-

Summer, for which reaſon, he adviſes not to cover over much the Heads of Children, which are ſtrengthened by being left bare, and rendred more fit to endure external Injuries.

The Tables. VII. *The* Cranium *conſiſts of two Tables or Slates, the External and Internal, thinner in Women than in Men.* Of which, the one is thicker and ſmoother, the other harder, hollowed with ſeveral Furrows, to give way to the Veſſels creeping through the hard Meninx, from which Meninx, ſome remarkable Veſſels inſinuate themſelves near the Ears into the Plates of the Skull, and moiſten the ſpace between. And the Reaſon why the *Cranium* is made of a double Table, leaſt any Contuſion of the Head ſhould eaſily penetrate the whole *Cranium*, by which means, ſometimes one Table is only broken, the other remaining entire.

The Diploe. VIII. In the middle, between theſe Tables, lies hid a certain ſpungy and cavernous Subſtance, containing a marrowy Juice, ſomewhat bloody, for the Nouriſhment of the *Cranium*, which is made out of the Blood flowing through the ſmall Arteries, which paſs through the little Holes of the Tables. And this is that Blood, which when the Skull is trepann'd, when you come to the *Diplois*, flows forth ſomewhat ruddy. Concerning this Blood, *Riolanus* has ſomething worthy to be obſerved by all Practitioners. *From theſe Caruncles*, ſays he, (that is, the ſpungy little Caverns, ſeated between each Table) *being very much contus'd, the Blood being ſqueez'd and putrifying, ulcerates the Bone, outwardly appearing entire; but the matter ſweating forth from the inner Table, putrifies the Brain it ſelf. Wherefore, if in ſcraping the* Cranium, *you perceive the Blood to diſtil forth, never think for that reaſon that the Blood penetrates the ſecond Table, becauſe the Blood flows from the foreſaid middle Space.*

This middle Spungy ſpace between the double Tablature of the *Cranium*, by *Hippocrates* and the Anatomiſts is call'd *Diploe*, though *Galen* rather chooſes to call the External and Internal Table, both taken together *Diploe*.

This middle ſpace is ſometime bigger, ſometimes leſs, ſometimes ſcarcely diſcernable, where both Tables ſeem to unite and conſtitute the ſimple and pellucid *Cranium*. *Bartholinus* reports that he diſſected a *Cranium* wherein this middle Space was altogether wanting; and all the *Cranium* ſeem to conſiſt all of one Table: perhaps, becauſe the Bones being dryed and contracted through Age, it did not manifeſtly appear: or elſe, becauſe the *Cranium* was only diſſected in that Part by *Bartholin*, where both the Tables unite together, and leſt the other ſpungy Part untouch'd. For Anatomiſts rarely cut the whole *Cranium* into ſmall Parts.

Hippocrates making mention of ſome certain Caruncles, means that middle ſpungy Subſtance of the *Cranium*, which *Fallopius* not perceiving, ſeeks after other particular Caruncles in that ſpungy Subſtance; but erroneouſly; for *Hippocrates* by thoſe Caruncles, means no other than that ſpungy Subſtance; for that there are no other Caruncles in that Subſtance. But ſometimes it happens, that in Wounds and grievous Contuſions of the Head, that a ſpungy *Hypoſarcoſis* grows out from that middle ſpace; which nevertheleſs was no more in that ſpungineſs before, than the fleſh in the Pyramidical Body near the Teſticle before the Sarcocele Burſtneſs.

In this ſpungy middle Space, eſpecially where the Perſons are infected with the French Diſeaſe, a certain vitious Humor gathers together, which in time growing more ſharp and virulent, corrodes the Tables themſelves, but more frequently the exterior, as being leſs hard, and cauſes dreadful Pains in the *Perioſteum* and *Pericranium*: ſometimes we have ſeen both the Interior and Exterior corroded, and ſo the whole *Cranium* perforated. Which *Palmarius*, *Riolanus* and *Benivenius* confirm by their own Obſervation.

CHAP.

CHAP. IV.

Of the Commiſſures of the Bones of the Cranium.

THE Bones of the *Cranium* are joyned together with various Commiſſures, which ſome call generally *Sutures:* Others more properly diſtinguiſh into *Sutures* and Harmonies.

The Sutures.

I. *A* Suture *is a certain Compoſure of the Bones, like things ſow'd with Seams, diſtinguiſhing and conjoyning the Bones.* Which in the upper part of the Head reſembles two Saws with their Teeth clapt together.

In the *Cranium* there are many *Sutures*, alike both for Number and Situation, both in Men and Women, contrary to *Ariſtotles* Opinion. The Skull is ſeldom ſeen without Sutures. And probable it is, that in young People it is never without Sutures, for that ſuch a Skull as it would be leſs apt to reſiſt external Injuries, and it would hinder the Growth and Diſtention of the Head, with the reſt of the Body. Yet *Ariſtotle* tells of Skulls that have been ſeen without *Sutures*; and among the *Neoterics*, *Veſalius*, *Fallopius*, *Coiter*, *Johannes à Cruce*, *Alexander Benedictus*, and others aſſert the ſame, and as is ſhewn at *Helmſtadt*, and the Monaſtery of the *French* at *Heidelbergh*; which were perhaps the Skulls of old Men, in which thoſe Sutures were dry'd up; ſuch as I have two by me at this preſent, and as have been many times ſeen in other places. And thus we are to underſtand *Herodotus*, *Arrianus*, and *Arrian* concerning the Heads of the *Moors* and *Ethiopians*, by them reported to be without *Sutures*, not that they were without *Sutures* when they were young, but were afterwards ſo hardned by the extream Heat of the Air, and drineſs of Age, that the *Sutures* united.

Sutures are twofold.

II. *Theſe* Sutures *are twofold*; ſome proper to the Skull, others call'd Illegitimate.

The Real.

III. *The real* Sutures *reſembling the Teeth of two Saws clapp'd one into another, and hence call'd* Serratæ. Theſe, I ſay, will ſometimes part aſunder and give way to Humors and Vapors moleſting the Brain, as in thoſe *Hydrocephalics* troubled with redundancy of ſerous Humors.

The Illegitimate.

IV. *The Illegitimate* Sutures *lying upon the Bone like Scales, are therefore call'd* Squamous. But theſe Commiſſures are rather to be referred to Harmony than *Suture*, or elſe to the middle between both, and therefore are not unduly called Harmonical Sutures.

The real *Sutures* are three.

The Coronal.

V. *The firſt, which is foremoſt, is the* Coronal, becauſe it ſurrounds the Fore-part of the Head like a Crown. This runs forth from one Temple to the other Tranſverſe above the Forehead, and joyns the Bones of the Forehead with the Bones of the hinder Part of the Head.

The Lamdoidal.

VI. *The Second, which is the hindermoſt, oppoſed to this, reſembling a Greek* Λ *and therefore call'd* Lamdoidalis, by others, from the Figure of a *Ypſilon*, *Hyſiloides*, and by others, *the Suture of the Prow.* This riſes from the Baſis of the hinder Part of the Head, about the Roots of the Mammary Proceſſes, and aſcending obliquely to both Ears, terminates in a Cone at the *Sagittale*, and diſtinguiſhes the Bone of the hinder Part of the Head, from that of the Temples and Fore-part of the Head.

But in the Bone of the hinder Part of the Head, frequent in Children, eſpecially ſuch as have large Skulls behind, Nature ſeems to ſport her ſelf. For ſometimes it is ſeparated with a Tranſverſe *Suture*, ſometimes bounded with a double *Suture*, as if the leſſer Triangle were included in the greater, and ſometimes with a triple *Suture*, the greater Triangle including two leſſer. Which included Bones, are called by the Anatomiſts *Triangulars* and *Triqueters*. For which reaſon, ſometimes, but very rarely, certain other little triangular, oblong, oval Bones are there found, as well in the right as left ſide of the Bone; many times two, three, or four, conjoyn'd with their *Sutures*, firſt obſerv'd by *Olaus Worm*, and more conſpicuous in the Concave Part of the Head, than in the Convex, of which, the biggeſt does not exceed a Thumb-nail. But notwithſtanding all this multiformity, the whole Bone of the Head, even in young People, is one continu'd Bone, but ſuch whoſe other Parts have already acquired a bony Hardneſs, others not, which when they have once attained, then they differ nothing from the reſt of the Particles of the Bone.

The Sagittal.

VII. *The third, which is the middlemoſt, is called the* Sagittal, becauſe that like an Arrow it is carried from the top of the *Lambdoidal* all the length of the upper Part of the Head to the middle of the *Coronal* in grown People. This diſtinguiſhes and joyns the Bone of the *Bregma*; and in Infants, for the firſt two or three years, and in ſome Children, to the eight or ninth year, paſſing the middle of the *Coronal*, runs forth to the upper Part of the Noſe, dividing the Bone of the Forehead into two. Which *Suture* of the Forehead, in grown People, unites by true Symphoſis, in ſuch a manner, that no Foot-ſteps are to be ſeen. Yet I have by me the Skull of a certain Perſon fifty years of age, wherein this *Suture* is altogether entire, the *Sagittal* between the Bones of the *Bregma*, and the *Lambdoidal* being hardly conſpicuous. *Galen*, *Veſalius* and *Sylvius* have alſo obſerved the *Sagittal Suture* in Infants reaching through the middle Bone of the hinder part of the Head to the beginning of the Spinal Marrow. Which *Fallopius* utterly denies to have ever been.

The Illegitimate Sutures.

VIII. *The Illegitimate* Sutures *are two.*

The Squamoides.

IX. *The firſt carried upward with a circular Courſe from the Root of the Mammilary Proceſs, ſurrounds the Temple-bone on each ſide of the Head, and proceeds downwards to the Baſis of the Ear, joyning the Bones of the hinder and fore-part of the Head and the* Sphenoides *with the Temples, with a ſcalie Contexture, therefore call'd the* Squamoides *Suture*; which looſe Conjunction is moſt commodious for this Part, in regard of ſome Motion of the Temple-bone, which it performs, together with its Muſcle in Maſtication.

The Second is carried downwards at the ſides, from the top of the Scalie Conjunction, obliquely toward the Orbit of the Eye to the beginning of the Firſt common *Suture*, and this joyns the upper Bones of the fore-part of the Head, and the lower Bone, with the Bone of the Forehead.

The four Commiſſures.

X. Beſides theſe *Sutures*, there are alſo four other *Sutures* proper to the *Cranium*, to be referred to Harmony, though *Bauhinus* will have them to be *Sutures*.

The firſt proceeds from the Extremity of the *Lambdoidal Suture*, at the Root of the ſtony Bones, obliquely to the Baſis of the Head toward the inner Parts, and is as it were an addition to the *Lambdoidal Suture*.

The ſecond is a Line in the middle Baſis, which is carried on both ſides with a ſhort Courſe to the Chink or Cleft which is common to the *Sphænoides* with the Bone of the Temples.

The third, more inwardly conſpicuous in the Fore-ſeat of the Skull, is carry'd to the lower Corners of the *Sphenoides*, and the hinder Part of the Orbits of the Eyes.

The fourth proceeds under the Spungy Bones of the Noſtrils, with an oblique Courſe to the Hole of the *Sphenoides-bone*.

Beſides the foreſaid *Sutures*, ſome deſcribe ſeveral others which are only the Parts of the ſaid *Sutures* extended farther, and only various Harmonies.

The common Commiſſures.

XI. *The Commiſſures common to the Skull and the Jaw, are reckoned to be five; which being of a middle ſort, between* Suture *and* Harmony, *are to be called* Harmonial Sutures.

The firſt, in the right Seat of the Orbit of the Eye, proceeds outward from the end of the fifth Suture, and imitates the Real Suture, and is common to the Bone of the Forehead, and the firſt Bone of the upper Jaw.

The ſecond appears in the lateral and lower Seat of the Eye.

The third aſcends from the inner and latteral Seat of the Eye, obliquely to the upper Part of the Noſe.

The fourth proceeds obliquely through the middle of the Jugal-bone, and joyns it with the Temple-bone, and imitates a Real Suture.

The fifth below, tends forward in the ſpaciouſneſs of the Noſtrils from the hinder Parts.

Theſe Sutures *Riolanus* deſcribes ſomewhat otherwiſe, and adds five more to theſe, which we believe to be only the Productions or Appendixes of the other.

The uſe of the Commiſſures.

XII. The uſe of theſe Sutures is partly to afford a more eaſie Paſſage to the Vapors, partly to prevent any contuſions in the Skull from going any farther than one Bone. Add to this, that the ſmall Fibres paſs through theſe from

from the hard Meninx, annexed to the *Pericranium*, by which, the hard Meninx, together with the Brain, are kept tite, to prevent their being mov'd out of their place by any violent Motion, which might cauſe the falling of the Ventricles of the Brain. Therefore, ſaid *Hippocrates*, and that truly, that they have ſoundeſt Heads who have moſt Sutures, and that heads without Sutures are continually diſtempered with many and various Vapors, which cauſe the Head-ach, Epilepſie and ſeveral other grievous Diſeaſes; beſides that, by any Blow or Fall, their Skulls are eaſily broken, and contract long Fiſſures.

Whether there can be a Contra-fiſſure.

XIII. ***This occaſions the mentioning of Fiſſures in the Skull, which we have ſaid are not extended farther than one Bone, but ſtop at the next Suture, and gives us an opportunity to enquire, how that decry'd Contra-fiſſure happens, when the Skull is ſplit in the oppoſite Part, to that where the Blow is given?*** Which *Hippocrates* is thought to deſcribe in theſe Words. *The Bone is broken under the Wound in another part of the Head than where the Ulcer is, and the Bone is laid bare.* Many have taken this place for a Confirmation of a Contra-fiſſure, and has drawn *Galen*, *Avicen*, *Celſus*, *Soranus*, *Johannes de Cruce*, *Johannes de Vigo*, and others, into the ſame Opinion; and which *Fontanus* endeavours to maintain, by the Example of a Boy that fell from a Wall fifteen foot high, in whoſe Head there was a Fracture with many Fiſſures, about the Temporal Muſcle, but the Skull being opened after his Death, two other Counter-fractures were found in the oppoſite ſide. But *Fallopius* ſtrenuouſly denies theſe Counter-fractures, not only from the Authorities of *Galen*, *Paulus* and others, but by his own Experience, and writes, that he has an hundred times ſeen Perſons bruiſed in the Head, but never could find any Counter-fractures. To which, we add our own Practiſe, who in the Field, have above two hundred times ſeen Soldiers, eſpecially Horſe-men, whoſe Skulls have been broken, but never could ſee any Counter-fractures; ſometimes indeed we have ſeen Fiſſures on both ſides, but it was only where the Perſons were wounded on both ſides their Heads. And ſo, without doubt, it was with that Boy, mentioned by *Fontanus*; though it was not known how he came to be hurt on the other ſide. So that we are clearly for denying Counter-fiſſures. As for *Hippocrates*, he ſpeaks nothing of any Counter-fiſſures; only he ſays that Matter is gathered together on the oppoſite ſide of the Skull to that which was broken, which we have alſo ſeen, but cannot allow it for any proof of a Counter-fiſſure.

CHAP. V.

Of the Bones of the whole Head in general.

THE Bones of the Head, ſome belong to the *Cranium*, others to the Jaws.

I. ***The Skull is caſt about the Brain like a Head-piece for its Security,*** as we have ſaid before. *The Skull.*

Now the Bones of the Skull are either proper or Common.

II. ***The Proper are either containing, or contain'd.*** *The proper Bones.*

The containing Bones that conſtitute the outward Scutel of the Skull, are ſix or ſeven. 1. The Bone of the Forehead, which in young Lads, rarely in thoſe that are of mature Age, is divided into two. 2. Two Bones of the fore-part of the Head. 3. One Bone of the hinder part of the Head. 4. Two Bones of the Temples.

The Contained Bones, are eight little Bones lying hid, in every ſtony Bone four, and ſerving for the Senſe of Hearing, the Anvil, little Hammer, Stirrup and orbicular Bone. To theſe *Bauhinus* adds two Bones of the Labirinth, and two nameleſs Bones.

III. ***The Bones common to the Skull with the upper Jaw, are two;*** the Wedg-reſembling-bone, and the Sieve-like-bone, with the ſpungy Appendix. *The common Bones.*

And thus the Bones of the *Cranium* are reckon'd to be ſometimes more, ſometimes fewer, according to the diverſity of Age, Sutures and Computation.

The Bones of the Jaws conſtitute the chiefeſt Part of the Face, and theſe are the Bones either of the upper or lower Jaws.

IV. ***The Bones of the upper Jaws are reckoned to be five;*** two of the *The Jaw Bones.*

lower Jaw in Children, which afterwards unite together, and in grown People become one Bone. In these Jaws are twenty or thirty Teeth.

The Cavities. V. *Now in these forementioned Bones of the Head, are several occult Cavities*, concerning the use of which there is great dispute amongst the Anatomists. *Riolanus* describes them joyntly together in these Words. *In the Head*, says he, *are many remarkable Cavities. There are four of each side, the* Maxillary *lying hid between the upper Jaws. The* Frontal *plac'd near the Eye-brows in the Forehead. The* Sphenoidean, *latent under the Seat of the* Sphenoides. *The* Mastoidean, *contained within the* Mastoides. *Only the* Mastoidean *is hollow and empty; but distinguished into seven, eight, or nine little Cells like a Hony-comb. The Entrance of the* Frontal *Cavity is discerned at the top and inner Parts of the Nostrils. The Ingress into the* Maxillary *Cavity, appears within the Cavity of the Nostrils, at the side of the Spungy Bone. The Entrance into the* Sphenoidean Cavity *lyes more deep within the Nostrils, the Spungy Bones being taken away. The Entrance into the* Maxillary Cavity *is evident without Incision of the Bones. The Entrance of the* Frontal Cavity *is seen, the* Frontal Cavity *being cut away above the Eye-brows. The Entrance of the* Sphenoides, *appears upon taking away the inner Table of the* Sphenoides. *The Entrance into the* Mastoidean, *is contained in the left side of the* Concha, *near the* Mastoidean Apophysis, *nor does it appear without breaking the Arch of the* Concha, *or tearing the Auditory* Porus.

The Holes. VI. *Besides these Cavities, there are several Holes in the Bones of the Skull, and some Furrows.* Of which *Riolanus* thus writes. *The Holes are inward and outward. The inner Holes are often twenty five, sometimes twenty seven, of each side twelve or thirteen, and one without a Pair, which affords a Passage to the Spinal Marrow. The first, is the* Ethmoides; *the second, the* Sphenoides; *the third, the Optic; the fourth, the Orbitane Sissure; the fifth, the Temple-hole, for the Nerve of the third Conjunction passing into the Temporal Muscle. The sixth, the Gustative; the seventh, the second Gustative; the eighth, the Jugular; the ninth, the Carotic; the tenth, the Auditory; the eleventh, the Jugular; the twelfth, the Ligous; the thirteenth, the last uneven Cervical. The External, according to* Sylvius, *are ten on each side; to which, I add the eleventh,* i. e. *the External Hole of the Ear. Also at the Root of the* Styloides, *at the Extremity of the Auricular Apophysis, without-side there is a Hole bipartited within-side, and divided with a thin Scale, which appears, and looks into the beginning of the Hollowness. Of the external Holes, the first is the Superciliar; the second, the Lachrymal; the third, the External Orbitary; the fourth, the Ethmoids Orbitary; the fifth, above the Palate; the sixth, In the Extremity of the Palate; the seventh, the Sciſſure under the Zygoma; the eighth and ninth, within the Gaping above the Wing-resembling Apophysis; the tenth, the Mastoides; the eleventh, the External Auditory Hole.*

The Fosse. VII. *The Furrows or Moats, are External and Internal. The Internal six in the Basis of the inner Part of the Skull. Two Frontals, two Temple Furrows, and two Occipitals. The External are seven on each side; to which I add an eight, which is the Cavity of the Nostrils. 1. The Ocular. 2. The Nasal. 3. The Zygomatic. 4. Above the Palate. 5. The Wing-resembling. 6, 7. The Auditory of the lower Jaw. 8. In the Hole of the sixth Conjunction.*

Thus far *Roilanus*, now we shall see the difference between him and us in the following Descriptions.

CHAP. VI.

Of the Proper Bones of the Skull in Specie.

THE Bones of the Skull are several, the Bones of the Forehead, fore and hinder Part of the Head and Temples.

The Forehead Bone. I. *The Fore-head Bone, by others call'd* Os Puppis, in Infants at the upper part is soft and double, as being divided by the Sagittal Suture, running out to the top of the Nose, which uniting and vanishing in grown People, becomes one, and that so exactly, as if it had never been divided. In old Men it is rarely seen divided by a Suture.

The Cell of the Forehead Bone. II. *It possesses the fore-part of the Head, and is of a semicircular Figure between both Tables, distinguished with a little Cell*, and bony Scales, and girt with a most slender Membrane, sometimes empty, sometimes

times full of a ſlimy juice, which in Infants eſpecially flat fac'd, or that have a divided Forehead is hardly conſpicuous. This is not very large in Men, but in Oxen, Horſes, Sheep and the like, it has a remakable large Cavity, which breeds Worms as ſome ſay in the Summer time which makes thoſe Animals run Mad; which make expert Farriers, for the Cure of that Diſeaſe, open the Head about that place and take out the Worms.

The Exterior Table making this Moat, forms the upper flat Part of the Orbit of the Eye. The other conſtitutes the Gibbous Extuberance with many Prominences as if it were an Arch on each ſide above the Eyes.

This Furrow or Moat is furniſh'd with ſeveral little holes terminating in the ſpaciouſneſs of the Noſe; to which little holes is added one little hole ending within the Skull above the Fence of the Sphenoides-bone: which nevertheleſs for the moſt part is not found to be previous; becauſe perhaps it conſolidates in Perſons of mature Age. *Riolanus* believes that it aſſiſts the long Adheſion of the hard *Meninx*.

The uſe of the Cell.

III. *Concerning the Uſe of this little Cell, there are various Opinions.* Some think it ſerves for the preparation of the Air in the Generation of Animal Spirits: others for the longer preſervation of the Odoriferous Air, others for the reception of the Flegmatic Excrement, others to render the Voice ſonorous. But theſe are all groundleſs conjectures. For neither can any Air meet here to compleat the Generation of Animal Spirits; nor is there any need of the preſervation of Odoriferous Airs in this place; beſides that the ventricles of the Brain are appointed fort he receptacles of Flegmatic Excrements, which are rarely found here, and then but in ſmall quantities: nor does it give any ſound to the Voice, which proceeds from the Larynx and paſſage of the Noſe, ſo that we are ſtill at a loſs what the uſe of this Cavity is, nevertheleſs, we believe ſo remarkable a Cavity, eſpecially in Brutes was not granted for nothing.

The Proceſſes.

IV. *There are ſmall Proceſſes belonging to this Bone of the Forehead prominent on both ſides at the corners of the Eyes, conſtituting the upper part of the Orbit.*

The Furrow.

V. *Withinſide alſo it has a furrow not very deep, hollow'd upwards through the middle, affording room to the large hollowneſs of the hard Meninx.*

The Holes.

VI. It has alſo holes, ſometimes one oblong or round, ſometime two at the middle of each Eyebrow, and terminating into the Orbit of the Eye; through which a Nerve of the third Conjunction aſcends from the ſeat of the Eye to the Eye-lids, the Muſcles of the Forehead and Skin. To this we may add a third hole ſeated about the *Creſted Bone*, and ending in the foreſaid furrow; which is often obſerved not to be perforated.

The Bones of the Bregma.

VII. *The Bones of the Mold of the Head, or top of the Head, or Bregma, are two,* placed in the upper part of the Head, and joyn'd together by a real Suture, as alſo to the Bones of the Forehead and hinder Part of the Head, and adhering to the Temples by a Baſtard Suture.

Their Figure.

VIII. *Being joyned together they form a Convex and Semicircular figure.*

Subſtance.

IX. *The Subſtance is hard in grown Perſons, but thinner and more porous then the reſt of the Bones;* for the more eaſie paſſage of the Vapours: In Infants by reaſon of their redundant Moiſture they are Membranous and ſoft, but begin to harden when they begin to ſpeak, ſeldom that ſoftneſs remains to perfect Age; yet I obſerved it once in a Lady of forty Years of Age; and *Bauhinus* writes, that it was ſo with his firſt Wife. And *Lyndan* relates Laxities and ſoftneſs in the Skull of a Woman thirty years old, that if her Head ak'd, or that ſhe fell in labour, the Coronal Suture would gape the breadth of four Thumbs, and ſhew the Motion of the Thumb conſpicuous.

The uſe of Gaping.

X. *The uſe of this gaping is,* 1. For the Exhalation of thick and viſcous humors, that redound in the moiſt Brain of Children. 2. To the end that in the delivery theſe upper Bones cloſing by compreſſion may afford the more eaſie paſſage to the Infant through the ſtreights of the Hypogaſtrion-Bone.

Theſe Bones of the Fore-part of the Head, though they are generally two, yet in Old men the Suture being clos'd up, they become one ſolid Bone.

XI. *Without*

The Furrows. XI. *Without ſide they are ſmooth, within ſide rough, having ſeveral furrows in the inner Part long and winding and receiving the Veins of the hard Meninx*; two alſo, and ſometimes three or four at the ſides of the *Sagittal* Suture, as it were imprinted with the Top of the Finger, and furniſh'd with ſeveral little holes penetrating to the *Delplois*, to which furrows the *Dura Mater* firmly adheres, ſo that it often tears it taking away the Skull. Through thoſe little holes certain Diminutive Arteries enter the *Diplois* out of the *Dura Mater*, and divers little Veins go from the *Diplois* to the *Dura Mater*, which Veſſels being broken in taking off the Skull diſcovers a great many little drops of Blood in thoſe places, at the Top of the *Menynx*.

The Bone of the Occiput. XII. *The Bone of the hinder Part of the Head, call'd the* Baſillary, *the* Prow *and Box-bone, conſtitutes the hinder and lower Part of the Head.*

This is all one in grown People, very ſeldom divided into ſeveral Bones: but in Children frequently into three or four, or according to ſome into five, ſix or ſeven Bones. But *Fallopius* never obſerv'd more then four, with whom *Eiſſon* agrees.

Shape. XIII. *The Figure of it is Triangular, hollow within, convex without.*

Subſtance. XIV. *The Subſtance of it is thick and hard, ſtronger then the reſt of the Bones of the Skull to preſerve the hinder Part of the Head from external injuries.* Yet is it not in all places of an equal thickneſs, but in ſome Parts thicker, in ſome Parts thinner.

It is faſtened to the Bones of the fore-part of the Head and Temples, and to the Wedg-like Bone.

Cavities. XV. *There are nine Cavities in it, which* Riolanus *calls Ditches*; two without-ſide, in the lower Part of the ſides of the great hole. Seven within, of which the loweſt and biggeſt receive the Protuberances of the Cerebel. To which are joyn'd two others, one of each ſide, which aſcend obliquely from the Bones of the Temples, and proceed tranſverſly through the Bones of the hinder Part of the Head, unite in the middle of it and receive the lateral Cavities of the hard *Meninx*. From theſe a third aſcends in a ſtreight line to the Bones of the *Bregma*, and admit the upper and large Cavity of the ſame *Meninx*.

Proceſſes. XVI. *Two larger Proceſſes ſtand at the ſide of the large hole of the Marrow, looking toward the inner Parts of the Mouth:* to which two others ſomewhat leſs and plain, are joyned toward the hinder Parts, which being all covered with a ſlippery Griſtle, are received by the Cavities of the firſt, and ſerve for the Articulation of the Head. To theſe within ſide two other Eminencies are oppos'd; ſo that in the ſame place the Bone bunches forth both inward and outward. There is alſo a fifth to be added, which is the biggeſt Proceſs contributing great ſtrength to this Bone at the lower end, where it is ſlenderer, which aſcending within ſide directly from the great hole, diſtinguiſhes the Protuberances of the Cerebel. In Dogs the tranſverſe Proceſs reſts upon this at the upper Part, dividing the Brain from the Cerebel.

Holes. XVII. *It hath five holes*; one which is the largeſt below, through which the long Marrow ſlides into the Cavity of the Vertebres. To which at the ſides two more holes joyn, for the paſſage of the ſeventh Pair of the Nerves, and Artery and a Vein. At the ſides of theſe on both ſides, between the little Head of the hinder Part of the Head, and the *Styloides* Appendix, there is a large long hole to be ſeen, common to the Bone of the Temples, affording paſſage to the ſixth Pair of the Nerves, as alſo to a Branch of the *Carotis* Artery and the *Jugular* Vein. Beſides this hole, ſome Anatomiſts obſerve ſometime though very ſeldome in the outward Capital ſeat of this Bone on each ſide, a proper hole, not very large, which alſo tranſmits an Artery and a Vein.

The Bones of the Temples. XVIII. *The Bones of the Temples, poſſeſs the lateral Regions of the Head,* on each ſide one, of which the Exterior and Superior Part is called the *Scaly Bone*, by reaſon of the flat thinneſs of the Scale, the lower is called the *Stony Bone*, which hardneſs it requires to render it more fit for the repercuſſion of ſound.

All theſe particular Bones of the Temples, in Perſons of mature Age, are one continuous Bone; but in Infants the Scaly Part is divided from the Bony; alſo in Children till the ſeventh year, the foremoſt Circle of the Audi-

tory

tory paſſage is divided from it by an interceding Griſtle; the Foot-ſteps of which Diviſion, in Perſons grown up are in ſome meaſure to be ſeen remaining at the beginning of that paſſage.

Shape. XIX. *The figure of it more upward is Semicircular and equal, more below and more inward, rough and unequal with many Protuberances, like the jetting forth of the Rocks.* The ſubſtance alſo of it at the ſides is thinner; below and within ſide much thicker.

Cavities. XX. *There are two Cavities in this Bone to be conſidered.* The more outward larger, overcaſt with a Griſtle, between the Auditory paſſage and the Proceſs of the Jugal Bone, which receives the long Head of the lower Jaw.

The innermoſt is leſs, common to the Bone of the hinder part of the Head, ſeated at the ſaid Proceſs behind.

The Styloides. XXI. *Cloſe by thoſe Cavities ſtands a long Appendix, ſharp-pointed and ſlender, called the* Styloides *or* Bodkin-bone, which in Infants appears Griſtly, in Men grown is Bony. This in boyl'd Carkaſſes is eaſily diſtinguiſhed.

The Mamillary Proceſſes. XXII. Alſo there are two other External Proceſſes to be obſerved. The *firſt* obtuſe, thick and ſhort, with-inſide ſomewhat concave from the like of a Cows Teat, call'd the *Mamillary Proceſs*; which *Fallopius* and *Bauhinus* deny to be in Children, but that it grows afterwards.

The Os jugal. XXIII. The *Second* is carry'd forward from the paſſage of the Ear, and by a long Suture is joyned with the Bone of the upper Jaw, and ſo by the means of two *Apophyſis* concurring and united together is form'd the Bone of the *Zygoma* or *Jugal*, ſo called, becauſe it reſembles an Oxes Yoke, and extends it ſelf like a Bridg from the Eye to the Ear; and is very hard and ſolid, contrary to what *Columbus* thought, who would have it to be hollow. Proceeding on both ſides with thick Roots, it grows ſlender in the middle. It is made for the Security of the Temple Muſcle, and the riſe of the Maſter Muſcle; alſo to the end the Tendon of the *Crataphyte* Muſcle may be fortify'd with a kind of Stony Bulwark, and the Protuberant Bone of the Cheeks underpropt with a ſort of ſtrong Joynt.

The *Third*, bunching out in length to the inner Baſis of the Skull, from its ſingular hardneſs and inequality call'd the Rocky, proceeds with a broad beginning from the Bone of the Temples and ends by degrees in a ſharp point, without ſide ſomewhat rough, within ſide altogether ſmooth, but unequal with many Tubercles, by reaſon of the Cavities which are to be form'd therein. This has two holes within the Skull, through the foremoſt and leaſt of which a ſmall Artery; through the other which is bigger and looks towards the hinder Parts, the Auditory Nerve enters the inner Cavity and Caverns, which preſently after its Ingreſs being divided into two Branches, goes away through two inner different holes into the upper and lower Cavity, the Labyrinth, and the *Periwinckle*. Without ſide of the Skull it has three holes. The firſt is the Auditory Paſſage, with which a broad paſſage opens into it, and carry'd from the hinder Part obliquely forward and upward, grows narrow by degrees, to collect the reverberated Air; entring at a larger paſſage within that narrow ſtreight, for the more perfection of the hearing. Moreover to the end that in that oblique Tortuoſity the violence of the Airs may be ſomewhat broken, and ſo ſtrike upon the *Tympanum* with leſs force. The Orifice of this paſſage in Children new born is altother Griſtly, but in a ſhort time it grows Bony by degrees; and after ſeven or eight Months by means of the Griſtle is ſtill diſtinguiſhed from the reſt of the Bone, and is ſeparated by boyling, but afterwards it is dry'd to that degree, that it can never more be ſeparated tho there may ſome appearance of the firſt ſepartion remain in the Skulls of Men perfectly grown up. Adjoyning to this paſſage, near the paſſage of the *Sphenoides* Bone ſtands the *Second* hole, narrow, ſhort and oblique, through which a Vein runs to the Jugulars through the inner Cavity. The *Third* hole is ſeated between the *Mamillary* Proceſs, and the *Styloides* Appendix; and terminates in the paſſage that goes from the Ear to the Mouth.

In this Proceſs or Rocky Bone is comprehended the Organ of hearing, and therein lye hid the Tympanum, Labyrinth and Periwincle; as alſo four Bones, the Anvile, Hammer, Stirrup, and Orbicular-bone. Of which *lib.* 3. *cap.* 18.

CHAP.

CHAP. VII.

Of the Bones common to the Skull, with the upper Jaw.

THere are two Bones common to the Skull, with the upper Jaw, the Wedge-like, and the Sieve-like Bones.

The Wedge-like Bone. I. *The Wedge-like, by the Greeks* σφηνοειδὲς, *not that it resembles a Wedge in Shape, but is as it were wedg'd in among the rest of the Bones. But because it is of various Figures, it is therefore called the Multiform Bone, and because it constitutes the Basis of the Skull is the Basilar Bone.*

In Infants it consists of several Bones united by a Gristle, of which, the first is said to separate scarce a Fingers breadth from the Crowns of the hinder Part of the Head. The second comprehends the Horses Saddle, and the Processes design'd for the Visory Nerves. The third and fourth are the winged and flat Processes. On the other side, *Riolanus* writes that the Wedge-bone in Children, till the twelfth year, consists of a double Bone only. But if the Wedge-bone in Infants be but more accurately observed, you shall find it to consist of three Bones, the biggest in the middle, which constitutes the Basis, forms the Saddle, and spreads forth two Wings forward toward the Sides, and two less, constituting the Batts Wings. In progress of years, all these three Bones are joyned and united into one Bone. To these some add the Bone called the *Plough-share Bone*, or *Os Vomer*, as a part of the *Sphenoides*, because it is fixed to it below. Which however dislikes *Fallopius* and *Riolanus*, who describe that Bone distinct and separate.

The Situation. II. It is seated in the middle Basis of the Head, and adjoyning to it on every side, stands the proper Bones of the *Cranium*, as also the Bones of the upper Jaw, and are fasten'd to it by bastard Sutures and Harmonies, which in the Perfection of Age are quite obliterated.

The Substance. III. *The Substance of it in the middle is thick, but in the lateral Expansions thinner, hard and scaly,* which in Children till twelve years of age seems to be solid, but in Men grown, consists of two Tables, and a middle spungy Cavity, which appears under the Saddle.

Its Processes. IV. It is furnished with various Processes, External and Internal.

The External are four; of which, two are conspicuous near the bony Fence of the Nostrils and Palate, where it coheres with the upper Jaw; from their Figure call'd πτερυγοειδὲις, or Wing-resembling, by others call'd the Batts-wings. The other two occurring behind, are extended toward the *Styloides*, with double Tops or Points.

The Internal are also four opposite to each other, and call'd κλινοειδεὶς, because they resemble the four Legs of a Bed or Table. Of these, the two foremost and bigest are taper'd by degrees, from a broad Basis to a sharp Point. The two hindermost in some never jet out, but resemble a Wall, and are accounted as one. However, most commonly being stretched out in breadth, they taper into two Points, somewhat hollowed in the middle, and these Processes, together with the Spaces between them, from the likeness of a Turkish Saddle, is called *Sella Equina*, *Sella Turcica*, *Sella Sphenoidis*, and in one Word, *Ephippion*.

Whether the Saddle be perforated. V. *Galen* writes, that the Sieve-like Bone is perforated with many Holes, for the passage of the Flegm collected in the Kernel; which Opinion is applauded by *J. Sylvius*, *Riolanus*, *Casser*, *Hoffman*, and *de le Boe Sylvius*. *Puteus* also writes, that he saw these Holes in an Anatomy at *Versailles*; and *Laurentius* reports, that he has found them in some dry'd Skulls, but that they are not to be found in a fresh Carkass, as being stuft up with Flegm. But as *Galen* was deceived, so were all his Followers. For the Cavity of the Bone of the Saddle is overcast with a continuous hard and thick Seat, never perforated with any Holes; which *Vesalius* also observes; with whom *Fallopius*, *Columbus*, *Valverda*, and *Bauhinus* agree. But which way the Flegm is evacuated, see *Lib.* 3. *Cap.* 8.

The Cavities. VI. *There are many Cavities in this Bone*; without side, in each wing-like Process, one long and deep, affording a Seat to the inner Wing-like Muscle. Within side, one in the middle of the *Ephippium*, remarkable above the rest, and almost round, underpropping the Pituitary Kernel, upon which another transverse and long one rests at the fore and upper part, affording room for the Con-

Conjunction of the Optic Nerves, and at the ſides there is another to be ſeen leſs deep of each ſide.

Holes. VII. *There are numbered ſeven Bones in both ſides of the* Sphœnoides.

The firſt, which is round, and affords a Paſſage for the Optic Nerve to the Eye, near the foremoſt Proceſſes of the *Ephippion.*

The ſecond, which is long and large, and tranſmits the ſecond Pair of Nerves to the Muſcles of the Eye, and a Branch of the third Pair to the Fore-head, Cheeks and Noſtrils, as alſo a large Branch of the *Carotis Artery* and *Temple Vein. Ingraſſias* and other Anatomiſts aſſert, that through the firſt, ſecond and third Neck, the pituitous Matter flows out of the Spitly Kernel, into the Spaciouſneſs of the Noſtrils, and thence proceeds forth into the Muſcles of the Eyes, and that Tears are alſo generated by them. But this Opinion has been already refuted, *Lib.* 3. *c.* 15. and *Lib.* 3. *c.* 6. and 8.

The third, which is ſmall and round, lies under the ſecond, and carries a Branch of the third and fifth Pair of the Nerves to the Temple Muſcle and *Pterygoides*, as alſo to the inner Membrane of the Noſtrils, and the upper Fore-Teeth.

The fourth, called the *Torn-Hole*, which is large, long and unequal, like a Ditch, ſeated in the outer ſide of the Orbit of the Eye, and is common to the *Sphœnoides*, with the Bone of the Jaw, and ſends forth a Branch of the fourth and preceding third Pair of the Nerves to the Temple-muſcle and Palate.

The fifth, which is long, but obvious to the hinder Proceſs of the *Ephippion*, admits a remarkable Branch of the *Carotis Artery*. *Veſalius* alſo believes, that it ſends forth a Branch alſo of the Jugular Vein.

The ſixth, which is Oval, joyns to the ſides of the Preceding, and grants a Paſſage to the fourth Pair of the Nerves.

The ſeventh, next to the preceding, ſmall and round, ſends forth a Root of the Jugular Vein from the hard Meninx.

The Sieve-like Bone. VIII. *The Sieve-like Bone, or Ethmoids*, ſeated in the middle Baſis of the Front between the Convex Part of each Eye, lies upon the Top of the Noſtrils, and is joyned with ſlight Harmonies to the Bone of the Forehead, the ſecond of the upper Jaw, and the *Sphœnoides*, which riper years frequently aboliſhes altogether.

This is perforated like a Sieve, with many little Holes like a Sieve, ſome ſtreight, ſome winding and oblique, among which, the biggeſt are thoſe which joyn to the Cocks-comb. It is covered with the hard *Meninx*, which is vulgarly ſaid to be very porous in this part, and pervious with many little Holes, which is not altogether true: For the *Meninx*, through thoſe little Holes, ſends forth ſeveral little Pipes towards the ſpungy Bones, filling the upper Parts of the Noſtrils through which the Flegm deſcending from the Ventricles of the Brain may flow, but nothing can aſcend upwards from the Noſtrils. *Vid. l.* 3. *c.* 8.

The Cocks-comb. IX. At the middle of this Bone ſtands an oblong, triangular, and ſharp pointed Proceſs, which from its reſemblance, is called the *Cocks-comb*; by *Fernelius*, the *Hard Wart*, and by *Sneider*, the *Fence* of the *Spungy Bone*; and this divides the Sieve-like Bone like a Hedg into two parts, and diſtinguiſhes the Mamillary Proceſſes of the Brain. Therefore ſome Anatomiſts will have the Sieve-like Bone to be double, and reckon the Cocks-comb for a Bone. This Cocks-comb in the upper Part, has a Protuberance ſomewhat unequal, with a certain hollow Aſperity, to which, the upper Hollowneſs of the *Scithe* is ſtrongly faſtned. In new born Infants this Cocks-comb is not to be found.

To the Cocks-comb on the other Part another Proceſs is oppoſed, thin and hard, diſtinguiſhing the Noſtrils at the upper part, whence it is called the *Plough-Share*, or the *Diaphragma* of the Noſtrils, or the *Interſtitium.*

The Spungy Bones. X. *To the upper Cavity of the Noſtrils the ſpungy Bones adhere*, reſembling a Pumice-ſtone, furniſhed with innumerable Labyrinthy Caverns, and winding little Holes fill'd with a very ſpungy ſort of Fleſh. Of which, *Hippocrates, In the Noſtrils there is no Hole*, ſays he, *but ſomewhat as ſpungy as a Spunge.* However *Hippocrates*, *Galen*, and other Anatomiſts, oft-times confound theſe with the Sieve-like Bones, and when they name Bones, oft times mean the Sieve-like. But we believe them to be diſtinct Bones, of which, the ſpungy ſort are pendulous, and adhere to the ſides of the Bones of the Noſe, but yet are different from both.

Their Uſe. XI. *Galen*, with others, will have the uſe of theſe ſpungy Sieve-like Bones to be for the Evacuation of the flegmatic Excrements out of the Brain; partly to carry the Exhalations to be ſmelt to the Mamillary Proceſſes; partly to ſtop the too ſudden ingreſs of the cold Air, or any ill Smell to the Brain. But this Opinion is refuted alſo at large, *l.* 3. *c.* 8. and 19.

CHAP. VIII.

Of the upper Jaw.

THE Jaws are two, the upper and the lower, conſtituting the outer part of the Face.

The upper Jaw. I. *The upper comprehends the lower and lateral Parts of the Orbit of the Eyes, the Noſtrils, Cheeks, Palate and the whole Order of the upper Teeth.*

This in Men is ſhort and ſemicircular for handſomeneſs ſake. In Brutes long. Moreover it is immoveable in Man, as it is in moſt other Creatures, unleſs Parrots, Phœnicopters and Crocodiles, unleſs there be any other Creatures unknown to us that move the upper Jaw.

Its Subſtance. II. *The Subſtance of it is ſolid, but cavernous within, eſpecially toward the Teeth*; in which place, in Children the Marrowy Juice is contained for the Nouriſhment, but that being conſumed by Age, the cavernous Bones remains. *Highmore* having diligently ſcarched into this Cavernoſity, found on each ſide, under the lower Seat of the Eye, where the Bone jets forth for the Guard of the Eye, a certain Den, ſeated at the lower ſides of the Noſe, remarkably hollow, ſpherical and ſomewhat oblong, and covered with a thin bony Scale, in the bottom of which, certain Protuberances riſe up, wherein the ſlender Points of the Roots of the Teeth are included. This Den is frequently empty, but ſometimes found full of Slime, which he believes diſtils through a certain Cavity from the little Caverns of the Fore-head Bone and the *Ethmoids*.

III. It receives Blood for Nouriſhment through the Branches of the Soporal Arteries, and the remainder after Nouriſhment, it ſends through little Veins to the External Jugular. It is compoſed of twelve Bones, ſix on each ſide, all joyned together by Harmonies, rather than thin Sutures. *Its Veſſels.*

The Firſt, almoſt triangular, is ſeated at the outer Corner of the Eye. This by means of its *Apophyſis*, joyned with the foremoſt Proceſs of the Temporal Bone, by an oblique Suture, forms the *Jugal Bone*, which being gibbous without, and hollow within, covers the Temple Muſcle.

The ſecond, which is ſmall, thin, pellucid and brittle, conſtitutes the Corner of the Eye, and in this the *Lachrymal Hole* is pervious to the Noſtrils, through which the ſerous Humor diſtilling from the Ventricles of the Brain, cauſes Tears in the Eyes, *Vid. Lib.* 3. *Cap.* 14. But to ſtop their continual flowing, there is a little Caruncle which lies upon this Hole, which hinders the ordinary Efflux, but gives way to it when more violent. Sometimes near this tender Bone, about the Top of the Noſe, and the bigger Corner of the Eye, certain Abſceſſes happen, which the *Greeks* call *Ægylopas*, which if neglected, corrode the Bone it ſelf, and cauſe a *Lachrymal Fiſtula*.

The Third is thin and pellucid, within the inner ſide of the Orbit of the Eye, interpoſed between the reſt, and more inward continuous to the ſpungy Bones of the Noſtrils.

The Fourth is the leaſt Bone of all, which conſtitutes the moſt porous Parts of the Cheeks and Palate, and receives the upper Row of the Teeth into its Caverns. It has a conſpicuous Hole, ſeated under the Orbit of the Eye, producing a Branch of the third Pair of the Nerves to the Face; alſo another Hole at the hinder Part of the cutting Teeth, in the middle bony Fence, again divided into two Holes toward the upper Parts. Of which, one tends to each Noſtril, and remits a little Vein thither out of it. Some think that the Spitly Humors, deſcending this way to the Noſtrils, flow into the Mouth; which is not probable. Moreover, under the Orbit of the Eye, at the lower ſide of the Noſe, there is a remarkable Hollowneſs, which however in Children is not eaſily found, but is hollowed by Age.

The

The Fifth, which is thin, little, long, and almoſt quadrangular, with its Pair, conſtitutes the more eminent Part of the Bones of the Noſe.

The Sixth, which is broad and thin, with its Pair, forms the Palate.

To theſe *Falloppius* adds one more, as does alſo *Columbus* and *Laurentius*, interpoſed between the innermoſt Part of the Palate and the *Sphenoides*, ſeparating the lower Part of the Noſtrils like a Fence, and thence called the Plough Share. To which *Veſalius* adds the ſpungy Bones already deſcribed.

CHAP. IX.

Of the lower Jaw.

THE lower Jaw in Man is moveable. This in Children till about ſeven years old, according to *Laurentius* and *Bartholine*, but not beyond the ſecond year according to *Riolanus*, conſiſts of two Bones, joyned in the Chin by *Synchondroſin*, which afterwards in riper years unite into one Bone, thick, hard and ſtrong.

This Conjunction, as *Galen* writes, is afterwards diſſolved, as was alſo obſerved by the French Chyrurgions, as *Riolanus* reports, and that the Jaw being broken by a Stone, was often cut away in that Part where the Bones united together. But notwithſtanding all this, the ſaid Coaleſcency has been obſerved in Men grown to be firmer than the reſt of the Bones of the Jaw, and that the Jaw is ſooner broken at the ſides than in that Coaleſcency.

Eiſſon obſerves, that he has ſometimes found another Diviſion in Infants on both ſides, almoſt in the middle place of each ſide, where the Bone acquires a thicker Protuberance, and endeavors to enlarge it ſelf.

Its Figure. I. ***This Jaw is ſhorter in Men and almoſt ſemicircular***, thick and broad before, behind divided like a Greek *Hypſylon*, or as *Platerus* will have it reſembling a Fork, for handſomneſs ſake.

Proceſſes. II. ***On both ſides at the end, it advances two Proceſſes, by ſome called Horns.*** The firſt of which being thin and broad, terminates in a ſharp Point, called in Greek κορώνη; to this alſo a Tendon of the Temple Muſcle is ſtrongly knit, and therefore the Laxation of this Jaw is accounted dangerous. The hinder Proceſs is obtuſe, furniſhed with a Neck and a long little Head, called *Condylus*, wrapt about with a Griſtle for the more eaſie Motion, by which it is joyned into the Cavity of the Rocky Bone, ſmooth'd with a Griſtle alſo, and is ty'd to it with a common Membranous Ligament.

Cavity. III. ***More inward it has a Cavity containing a marrowy Juice for the Nouriſhment of the Bone.*** Which in Men appears chiefly in the Fore-part toward the Region of the Chin.

Holes. IV. ***It is furniſhed with four Holes,*** of which, there is one internal on both ſides, ſeated at the beginnings of the ſaid Proceſſes, which admits a Nerve of the fourth Conjunction to be diſtributed to the Teeth, together with a ſmall Artery, and ſends forth a little Vein. So likewiſe the two other, which are leſſer and round, are both placed at the ſides of the Chin on each ſide, and ſends forth little Branches of the foreſaid Nerve outward to the lower Lip, its Muſcles and Skin.

In the Fore-part it is ſomewhat rough, having an unequal Excreſcence in the inner and middle Seat of the Chin, for the faſter Inſertion of the Nerves. It has alſo ſuperficial Cavities, both External and Internal, about the beginnings of the Proceſſes, for the Inſertion of the Muſcles.

It is alſo full of little Holes for the Inſertion of the Teeth, of which there is no certain number, in regard the number of the Teeth is not alike in all Perſons, but in ſome more, in ſome fewer.

Theſe Holes ſometimes periſh, ſometimes grow again. For upon the pulling out of a Tooth, if another does not preſently ſucceed, the Hole cloſes up ſo hard, that it is able to ſupply the Office of a Tooth. On the other ſide, when the Teeth of Wiſdom break forth at fifty or threeſcore years of age, as ſometimes they do, you ſhall have new Holes made. In Children alſo, when they ſhed a Tooth, it often happens that a new Hole is made, the other being quite ſtopp'd up.

Below the lower Jaw, under the Tongue, the *Hyoides Bone* is ſeated, of which, *Lib.* 3. *Cap.* 23.

CHAP. X.

Of the Teeth.

The Definition.

I. *THE Teeth, by the Greeks call'd* ὀδόντες *are ſmall Bones, hard, white, fixed into the Holes of the Jaws, by the way call'd* Gomphoſis, *appointed for the chewing of Food and ſerving alſo for Pronunciation.*

Whether they be Bones?

I ſay they are Bones: though it has been greatly diſputed whether they are Bones or no. But for the Affirmative, *Riolanus* produces theſe Reaſons. 1. Becauſe they were form'd out of the Seed with the reſt of the Bones. 2. Becauſe they are nouriſhed by the Blood; as the reſt of the Bones. 3. Becauſe they are hard like the reſt of the Bones. 4. Becauſe they do not feel in their own Subſtance, but only by the Perioſteums of their Roots, and by means of the little Nerves that enter into them, no otherwiſe than all the reſt of the Bones are ſenſible.

Their Subſtance.

III. *Now for the chewing of hard things, the Subſtance of the Teeth is alſo very hard,* and where they appear above their Holes ſmooth and naked, without any *Perioſteum*, but within their Holes rough, and enfolded with a thin Pellicle of a moſt quick Senſe, having a Cavity withinſide, which is manifeſt in the grinding Teeth when broken, but inviſible in the Dog-teeth and Nibbling-teeth, whereby they receive through the little Holes in the Roots, beſides a little Artery from the Roots, a little Nerve alſo from the Branch of the fourth Pair, expanded through a moſt thin little Membrane, which enfolds the ſaid Cavity; by means of which, and the *Perioſteum* inveſting the Roots, the Teeth are ſo ſenſible of Pain, though their bony Subſtance, which is deſtitute of the inner little Membrane and Nerve, is altogether inſenſible.

Veſſels.

IV. *Now theſe three Veſſels, Artery, Nerve and Vein, being firſt united, and wreath as it were into one ſmall Chard, begirt with a ſmall Membrane, enter the inner Part of the Jaw, and in a peculiar Channel different from the Caverns of the Marrow, run under the Teeth, though how they enter the Teeth in Men, we muſt confeſs is not diſcernible to the Sight;* for that although the ſmall Holes of the Roots, though they are ſomewhat conſpicuous in Infants, and ſeem to penetrate to the ſlimy Subſtance of the Roots, yet in Men of riper years become ſo narrow, that they are not to be diſcern'd by the Eye. But Reaſon tells us however, that there muſt be ſome ways, by means of which, thoſe Veſſels enter the inner Parts of the Teeth; which is apparent by their continual Nouriſhment from the Arteries and Veins; beſides that, the inner Cavity of the grinding Teeth, eſpecially the firſt mucous Subſtance is ſeen to be ſomewhat diſcoloured with Blood, and many times there follows a Flux of Blood upon drawing the Tooth. That there is ſome little Nerve that enters, is apparent by the quick Senſe of the Tooth. Moreover, though the Ingreſs of theſe Veſſels in the Teeth cannot be ſo well demonſtrated in Men; yet if you open the lower Jaw of an Ox at the inſide, preſently the Cavity containing the Marrow, and the Artery, Nerve and Vein, enfolded with their peculiar Membrane, appear in their proper Channel. The Membrane being cut, the little Nerve appears, conſiſting of ſeveral ſmall Threads, between which, the Veins and Arteries are carried, and the Membrane being removed, certain Fibres like Cobwebs are ſeen to be ſtretched from thence to the Roots of the Teeth. And upon the drawing of a Grinder or a cutting Tooth, you ſhall perceive ſmall Fibres ſticking to the Root of the Teeth, which are extended from the Hollowneſs of the Jaw. But this is to be wondered at, that the Dogs Teeth and cutting Teeth, which are leſs and fix'd with one Root, ſhould have large and conſpicuous Branches openly coming to them, and that the Grinders, which are larger, and fix'd with four Snaggs, ſhould only have capillary Branches to attend them, and that in a kind of hugger mugger. Which, no queſtion, is no otherwiſe in Men, were it diſcernible to the Sight.

Their Principles.

V. The Principles or Beginnings of the Teeth, generated with the reſt of the Parts in the Womb, lye latent between the Jaws and the Gums, within whoſe Encloſures they are brought to Perfection by degrees, wherein are firſt obſerved the Follicle, the bony Part, and the mucous Part.

VI. The

The Folliculus. VI. The white little Bladder, not exactly membranous, but somewhat slimy, covers the whole Teeth, as the Cortex of the Seed covers the Pith of a Plant, but never inseparably unites to the Plant. This by degrees is perforated upwards and downwards, and then the Tooth it self buds forth; in which beginning of it, two Substances are to be observed, the one bony, the other slimy.

The Bony part. VII. The bony Part is the Basis of the Tooth, which by degrees is hardned into a firm and white Substance, and thrust forth without the Gums. The beginnings are more conspicuous in the new born Infants in the cutting Teeth, less in the Dog-teeth, but in the Dog-teeth, 'tis long before they appear. *Vesalius*, *Columbus* and *Sylvius* thought this Basis to be an Epiphysis; which *Eustachius*, *Riolanus*, and *Fallopius* with good reason denies.

The slimy Part is the Root of the Tooth which is fixed in the Jaw, and consists of a thin Pellicle less white, which contains that pellucid Slime, somewhat hard, of a Colour betwixt White and Red, wherein you may perceive the small Rudiments of the Vessels to be intermix'd. Which Slime being enfolded within that Pellicle, continues so till the Age of two years, more or less, and is so soft, that being squeezed with the Fingers, the Root of the Tooth sweats forth Blood in the same manner as the Quills of Chickens or Pigeons Feathers; of which the upper Part is hard, and as it were solid, the lower hollow and mucous, and sweats forth Blood, being more vehemently squeez'd. In progress of time, this Mucous or Slime is first more and more hardned, and grows bony in the Circumference, then by degrees it hardens in the middle, yet so that there is a certain Cavity remaining at the middle of its thickness at the Root, in the Grinders conspicuous enough, in others not; as being hardly extended to that Part of the Tooth, eminent beyond the Gum; and is encompassed with a most thin Membrane of an acute Sense, constituted by the Expansion of a small Nerve. Thus this Slime being hardned by degrees, the Root encreases, perforates the little Bladder, and is fix'd into the Jaw it self. Then the little Bladder changing its use, becomes a Binding, or rather Soder to the Tooth; by means of which, it sticks as it were glew'd and plaistered to the Gums.

The time of cutting. VIII. *In this manner are the Teeth perfected that lye hid under the Gums*; out of which they do not break forth till some Months after the Birth, at the time which is call'd the Toothing-time. First break forth the upper and lower cutting Teeth, as of which, there is greatest use; afterwards the Dog-teeth, and lastly the Grinders, and that with a great deal of Pain, in regard they perforate the Flesh of the Gums; which if it be hard, makes the Passage more troublesome, and causes Convulsions and Looseness of the Belly, especially when the Dog-teeth cut the Gums. Now why the cutting Teeth break forth first, the Dog-teeth afterwards, *Aristotle* gives us the Reason. Because their Office is the first, for that the Food must first be bitten, before it can be chew'd; besides that, a lesser thing is sooner brought to perfection, than a greater, and the Fore-teeth are less than the Cheek-teeth.

After the twenty Teeth are come forth above and below, then the Grinders follow more leisurely, and that not before the fifth, sixth, or seventh year, till which time, they lye hid like small Points within the Jaws. Probably, because the Jaws before were not grown to a sufficient bigness, so that it had not room for twenty eight or thirty Teeth.

The Shedding. IX. *About the seventh or eight year, the foremost Teeth shed*, and others come in their Place. However all the Teeth do not always shed; but for the most part the Cutters and Dog-teeth, and of the Grinders those that stand next the Dog-teeth. Nay, I have observed that some have only shed their Cutting-teeth, and no other, and some only two or three of the Cutters, the rest remaining; so that there is nothing of certainty in this Matter.

This shedding of the Teeth never happens but once, or very seldom. Thus once in forty years I have known a Grinder to have shed, and another come in its room; and I have observed some Children to have shed their Fore-teeth twice, which have come again. Which Variety *Eustachius* observes, where he tells us, *That some renew their Teeth in the thirteenth and fourteenth Year; others at certain times, once after the seventh, and again after the fourteenth; and some have had a Tooth come again at twenty years of age, instead of another pull'd out. And sometimes young Men, well temper'd and lusty, have had their Cheek-teeth grown again, and sup-*

ply

ply the Room of that which was pull'd out before.

A Controverſie about ſhedding the Teeth.

X. *This Change of the Teeth has cauſed a great Diſpute, whether the firſt Teeth are true Teeth?* and whether thoſe that ſucceed are new Teeth, or only new Branches from the ſame Root? It being abſurd to avouch a new Generation of the Parts after the firſt Formation. For which reaſon, ſome aver that the firſt Teeth are no true Parts of the Body, but only various Particles generated from ſuperfluous Matter, and doing the Office of Teeth till the true Teeth come to perfection. Others ſay that the firſt and laſt Teeth are both generated in the Womb; but that the firſt Teeth being ſooneſt perfected, are ſooneſt come forth; the latter, being more ſlowly perfected, come out afterward, and thruſt the former out of their Holes. It being viſible in Anatomy, that thoſe Teeth which one ſhed in the ſeventh year, are ſeparated but a little way from thoſe which break forth in the ſeventh, and that there is no communion between them.

But neither of theſe Opinions come to the Point. For the firſt Teeth, about the ſeventh year firſt grow looſe, and afterwards ſhed. Only it is to be obſerved, that the Root it ſelf does not ſhed, but the upper Part that is next the Root. For we find by Experience, that if the Teeth be drawn Root and all, 'tis very ſeldom that another comes in the Room, or if another Tooth doth come, then 'tis certain that the Root was not wholy drawn; but that the lower Part being broken, remained in the Gum. And therefore great care is to be taken, that in pulling out looſe Teeth, you do not pull out Root and all, for then you can never expect a new Tooth. For this *Rolfinch* reproves *Columbus*, avouching that the Tooth ſheds Root and all, and renews Root and all, which is contrary to Reaſon and Experience, and therefore let it go.

We have obſerved in a tame Deer, every year or half year, a certain ſoft and ſlimy Subſtance under the Foundation of the Horns, to riſe like a Stool-ball from the Root of the Horns, upon which the looſe Horns inſiſted, which, as might be obſerved by the reſtleſneſs of the Beaſt, cauſed either Pain or ſome extream Itching in thoſe Parts, till the Horns fell off, and that then, from the ſame Root, new Horns grew again by degrees. So it is with the Teeth, in which that mucous Subſtance riſes from the Root under the Baſis of the Tooth, and looſens it with Pain, ſo that you may eaſily pull it out with your Fingers; and that unleſs it be pull'd out in time, the ſoft Subſtance being afterwards dry'd and hardened, it becomes ſtrongly fixed again, and another Tooth grows to the ſide of it from the ſame Root, which however is no new Tooth, but a new Branch proceeding from the ſame Root. So that 'tis no wonder the former Tooth is ſeparated at ſome diſtance from the latter Branch, becauſe it has no other communion with it, than by one Root common to both. This deceived *Euſtachius* and *Riolanus*, who perceiving the beginning of the ſecond Branch ſprouting forth under the former, write that they ſaw new Teeth lying hid under the firſt. Now the Reaſon why the latter Branch thruſts out the former, is by reaſon that the Hole is ſo narrow that it will not admit two Branches together, which however ſometimes it does, and then the latter Branch is joyned to the former at its beginning. Only becauſe the firſt Branch grows out of order, and defaces the Beauty of the Mouth, therefore generally it is either drawn or fil'd away. In the ſame manner it has ſometimes happen'd, that old Men have had new Teeth ſpring up from the remaining Roots of the old ones. Of which, *Joubert* produces an Example in a toothleſs Lady of ſeventy years of age, moſt of whoſe Teeth came again, but ſmall and weak. And *Sennertus* alſo relates another Story, upon the Authority of *George Tithſcard*, a Sileſian Phyſitian, of an old Matron almoſt ſeventy years of age, who bred twenty new Teeth with the ſame Pain, and the ſame Symptoms as happen in young Children. *At Utrecht*, there lives an old Woman at this time, of fourſcore years of age, who having loſt all her Teeth, had four of her cutting Teeth grew again, but two years ſince. And you ſhall find many other Examples of this nature in *Pliny*, *Neviſanus*, and *Alexander Benedictus*.

However it is to be underſtood, that in theſe ancient People, the Roots of the Teeth remain entire, though the Baſis of the Teeth that advances it ſelf above the Gums, were quite eaten away and periſhed.

The Dentes Sapientiæ.

XI. *About one, or ſix and twenty, or thirty years of age, the two fartheſt Cheek-teeth break forth with great Pain*, the Materials of which, remain

remain ſo long hidden in the little Holes of the Jaw imperfect, before it could acquire Perfection of Subſtance. Theſe are generally call'd *Double Teeth*, or the *Teeth of Underſtanding*, becauſe they ſhoot forth at the time when a Man arrives to his moſt ſolid Underſtanding.

Continual Growth. XII. The Teeth have alſo this peculiar above the Nature of other Bones, that their Growth and Increaſe is not prefixed, but grow continually all a Man's Life-time, ſo that what is dayly worn away by Maſtication and Chewing, renews again, which is apparent, if the Tooth, to which the oppoſite Tooth being drawn, upon which it uſually lights, be not worn away, for then it grows to ſuch a length, as to fill the oppoſite Hole. Or if the Tooth ſhooting forth out of its Hole tranſverſly toward the foremoſt or hinder Parts, exceeds the Row of the Teeth. For then if it ſhoot forward, the Tooth will perforate the Lip it ſelf, if backward, it will hinder the Motion of the Tongue. Thus I knew two young Ladies, who had each a ſharp Tooth which ſhot forth from the inner Root of the upper Cutting-tooth, and grew to that length, that it perforated the Tongue with an extraordinary Pain, and hindred the Speech; for which Reaſon, I cauſed them both be to drawn. And thus *Pliny*, *Euſtachius*, and *Alexander Benedict* are to be underſtood, when they write that they ſaw Teeth growing out of the Palate, as Meaning-teeth, which ſhooting forth from the Root of ſome upper Cutting-teeth through the Membrane of the Palate, extend themſelves toward the inner Parts of the Mouth.

However there are certain Limits, beyond which the Teeth never grow; notwithſtanding that they are ſometimes longer than ordinary.

The Order. XIII. *The Teeth are placed in the Jaws in one ſingle Row:* Seldom two Rows are ſeen, as *Pliny* reports of *Laodice*, the Daughter of *Mithridates*, and *Trimarchus* the Son of *Nicholes*. But more rarely three Rows, which *Rhodiginus* reports of *Hercules*, and *Columbus* obſerves in his own Son *Phœbus*. In Tigers and Elephants, three Rows are common. In like manner the Monſter call'd a *Manticora*, and the Fiſh call'd a *Moraxus*, are ſaid to have three Rows of Teeth. Sometimes indeed it happens in Men that here and there one of the Fore-Teeth may ſtand in a double Row; which comes to paſs when the Teeth ſhed, and that a new Sprig grows from the ſame Root, which growing upward, fixes it ſelf before another Tooth, either not ſhed or not pull'd out.

XIV. *The Bigneſs of the Teeth is of a moderate Size*; yet ſome are broader, ſome narrower, ſome longer, ſome ſhorter. *Bigneſs.*

XV. *The Number in all People is not the ſame*; ſometimes fifteen or ſixteen in each Jaw; yet ſome have more, ſome fewer, and they that have feweſt, have generally the broadeſt. *Hippocrates*, *Galen*, and *Ariſtotle* prefer the greater Number before the ſmaller, as betokening long Life; perhaps denoting the Plenty of the firſt Matter, and the Strength of the forming Faculty; or elſe becauſe the Nouriſhment is better prepared for Concoction, by the Maſtication of more, then few Teeth. It rarely happens, what *Plutarch* teſtifies of *Pyrrhus* King of the *Epirotes*, and *Pliny*, concerning the Son of *Pruſias* King of *Bithynia*, and what others write of *Eryptolemus* King of *Cyprus*, the Poet *Pherecrates* and *Sicinius*, that inſtead of Teeth, they had one continu'd Bone, diſtinguiſhed only with Lines, ſuch a one as *Bartholin* teſtifies he ſaw in a certain *Barbarian*; and *Melanthon*, in a certain Virgin, at the Court of Prince *Erneſt* of *Luneburgh*. *Number.*

The Teeth differ both in Shape and Uſe.

XVI. *Some are broad, ſharp and cutting, therefore call'd* Inciſorii; by the Greeks τομεῖς, from τέμνω to cut, the firſt that appear, ſeated in the fore-part of the Mouth, and furniſhed with one ſingle Root, ending in a ſharp Point. Theſe are four above and below, ſometimes three, ſeldom two, where they are very broad, ſo that they fill the whole Space between the Dog-Teeth. *The Inciſorii.*

XVII. *Others are very ſharp and ſtrong, and deeply rooted, called* Canini, *or Dog-teeth*, by *Ariſtotle* and *Galen* κυνοδόντες, two in each Jaw, next to the Cutting-teeth on each ſide, which break what the other cannot cut. Theſe the Vulgar call the Eye-teeth, and account it a dangerous thing to draw them, believing that their Roots reach to the Eyes, whereas the uppermoſt hardly paſs beyond the lower Brim of the Wings of the Noſe, with their Roots, and the lowermoſt are far diſtant from the Eyes. Others, with *Laurentius* *The Canini.*

tius and *Riolanus* believe that ſome portion of the Nerve moving the Eye is carryed to theſe Teeth, which is nothing ſo. *Riolanus* and *Spigelius* obſerve, that the Roots of the Fore-teeth and Dog-teeth, are frequently obſerved to be crooked, and that ſuch Teeth cannot be drawn without pulling away ſome Part of the Caſe.

The Grinders. XVIII. *Others are obtuſe and large as the Grinders, called* Mollares *and* Molitores, which grind the Meat like Grindſtones. The *Germans* (and the *Engliſh* too) call them the Cheek-teeth. The number of which is not in all People the ſame; generally ten in each Jaw; five of a ſide; to which if you add the Wiſdom-teeth, their Number will be increaſed. The two foremoſt that ſtand next to the Dog-teeth, are leſs than the reſt, and prominent with two little Excreſcences, the three hindermoſt are bigger, and unequal with four Extuberances being broad at the upper Part and almoſt four ſquare. They are fixed with two three or four Roots; for herein Nature ſports her ſelf. The two that ſtand next the Dog-teeth are alſo furniſhed for the moſt Part with two, behind with three or four, and above with more then below.

Their uſe. XIX. Concerning the uſe of the Teeth we have already ſpoken. But their uſe in Pronunciation is chiefly performed by the Fore-teeth, which they that want have a defect in their Speech, and pronounce but badly ſome Letters, as *C.D.L.T.X.Z.* Hence it is that *Pliny* rightly obſerves *that the two Fore-teeth govern the Voice and Speech, by a certain concert receiving the ſtrook of the Tongue; and according to their ſtructure and bigneſs, maim, ſoften and dull the Pronunciation, ſo that being loſt, Men loſe their Pronunciation.* *Galen*, aſcribes them a third uſe, to diſtinguiſh Savours and aſſiſt the reliſh of the Tongue; but the Bony Subſtance of the Teeth alone is altogether inſenſible, only by means of the *Perioſteum* and little Membrane that inveſts the inner Cavity; but whether the Teeth reliſh Savours by that means is much to be queſtioned; becauſe there is a great difference between the ſenſe of *Feeling* and *Taſting*. *vid. lib.* 3. *cap.* 14. and ſo the Teeth ſeem to be ſenſible of heat, cold, auſterity, and other tangible Qualities, but not to diſtinguiſh Savors.

CHAP. XI.

Of the Spine and its Vertebres in General.

IN the Second Part of the Skeleton are to be conſidered, the Vertebres of the Spine, the Bones *Sacrum* and of the *Coccyx*, the Ribs, the *Sternon*, the *Clavicles*, the *Scapularies*, and the Nameleſs Bones.

This latter Structure of the Trunk, *The Spine.* like a Pillar ſuſtains the Bulk of the Body, and extending it ſelf from the Head to the Huckle Bone, compos'd of Vertebres or Spondils, the *Os Sacrum* and Huckle-bone, fixed one upon another, and firmly faſtned by Ligaments, is vulgarly called the *Spine*, as being in the hinder Part furniſhed with Thorny or prickly Extuberances. The *Greeks* call it the *Sacred Pipe*, becauſe it is hollow'd like a Pipe, and contains and defends the Principle Part. It is alſo called ῥάχις from ῥήσσω to break, becauſe it ſeems to be a Bone Pillar broken into many Parts.

Now it behov'd this ſupport not to conſiſt of one but of many Bones, to the end the Body might bend every way. However in Old men it happens, that the Moiſture of the Griſtles being dry'd up, and the intervening Ligaments being hardned, that many Vertebres unite into one Bone. Of which I have an Example at home in the Skeleton of a certain hunch-back'd Perſon in which ſeven Vertebres are grown together in one. Which Coalition *Paræus* and other Anatomiſts have obſerved.

II. *Each Vertebre in grown People conſiſts of one Bone, and their Subſtance is thicker and more ſpungy, and where they are joynted, inveſted with a Griſtle, for eaſineſs of motion: in their Proceſſes their Subſtance is harder and more ſolid.* *The Subſtance.*

In Children every Vertebre conſiſts of ſeveral Bones. Which *Fallopius* has accurately obſerved. *In theſe Vertebres*, ſays he, *I have obſerved one thing, that they conſiſt of three Bony Parts; of which one is the Body it ſelf, the other two from the ſides of the hole of the Marrow. Theſe are faſtened with a Griſtle to the ſides of the Body on the right and left ſide, and where*

where the Spine is, one to another, which afterwards becoming Bony, expunges the Joyntures, this is true in all except the Second, and the two hinder Parts which conſiſt of four Parts, the Body, which conſtitute the ſides, and a fourth Tooth, which though called a Proceſs by all Anatomiſts, is really an Appendix reſembling a Nut, which is ſo faſtned at length, all the Griſtles being turned into a Bone, that it ſeems to be a Part of the Vertebre, and rather a Proceſs than an Appendix. Beſide the Firſt, the Second is alſo to be expected, as being compos'd not of three but two lateral Bones, wherein are certain hollowneſſes that comprehend the Head, which is bound together before with a Griſtle, near the Tooth of the Second *Vertebre*, and behind extended from the one to the other Bone. For that the firſt Vertebre in the new born Birth is deſtitute of that middle bony Body, granted to the reſt of the Vertebres, and in the ſtead of it has the ſaid Griſtle which afterwards in ripe Age become bony. However that ſubſtance which divides the ſeveral Vertebres into diverſe little Bones, rather ſeems to be a true Griſtle then that it is ſo; but a bony Part which has not yet acquired a Bony hardneſs.

The Figure. III. ***The Vertebres above and below are flat, within convex, behind unequal with many Proceſſes.***

The Holes IV. ***In the middle they are hollow'd with a great hole provided for the ſafe deſcent of the Spinal Marrow.*** At the ſides of this on each ſide lye two Cavities; of which the upper are leſs and the lowermoſt bigger; which concurring between the two Vertebres ſet one upon another, form thoſe holes on both ſides, through which the Nerves proceed from the Marrow, which are ſo broad as the thickneſs of the Nerve paſſing through requires. To the forming of theſe holes in the Neck both theſe Vertebres equally contribute. But in the Back and chiefly in the Loyns, all the holes are bor'd in the lower Part of every Vertebre. Beſides innumerable little holes conveighing the ſmall Arteries carrying the Nutritive Blood to the inner Subſtance of the Bone.

The Proceſſes. V. ***It has ſeven Proceſſes.*** Two upper aſcending and as many lower deſcending; Two tranſverſe, and one *Poſtic*, which is the biggeſt of all, and which all the Vertebres have, except the uppermoſt which is next to the Neck.

In new born Infants, the aſcending and deſcending Proceſſes have not yet attained a Bony hardneſs, but are ſmall, ſoft, and almoſt altogether wanting at that time. And hence a certain Diviſion or Cleft appears between every two Vertebres, fill'd with a Griſtle that conglutinates the two Griſtles.

Connexion. The Vertebres are knit together behind by Gyngliſm; before, by harmony, and without ſide by the hard Membrane; withinſide by a hard and ſtrong Membranous Ligament, extending it ſelf from the upper Vertebre of the Neck to the *Os Sacrum*; which many think to ariſe from the Griſtles of the Vertebres. Moreover they are conglutinated together with an interceding Griſtle.

The Spine being fram'd by the ſtructure of theſe Vertebres, has a Figure commodious for the Internal Parts and their Functions; and therefore it has a ſtreightneſs, that ſometimes bends ſomewhat backward, ſometimes bows forward. From the firſt Vertebre of the Neck to the ſeventh it bows forward; for the more commodious ſupport of the Gullet and *Aſperia Arteria*. From the firſt of the Back to the twelfth it protuberates backward to render the Domicils of the Heart and Lungs more capacious. The Loyns bend inward, the better to ſupport the Trunk of the deſcending *Aorta* and hollow Vein. The *Os Sacrum* protuberates outward to make the *Hypogaſtrion* more roomy, which is neceſſary for the Diſtention of the Bladder, but more eſpecially of the Womb.

CHAP. XII.

Of the Vertebres in Specie, of the Os Sacrum *and the Cuckow-bell or Huckle Bone.*

THE Vertebres, by the *Greeks* are called *Spondyls*, by reaſon of their continual Motion in bending the Body.

Numbers. The Vertebres of the whole Spine are numbred twenty four, ſeven of the Neck, twelve of the Back, and five of the Loyns, which are plac'd upon the *Os Sacrum* as a Baſis, with its Appendix the Coccyx-bone.

The Vertebres of the Neck. The Vertebres of the Neck differ one from another, and the reſt of the Spine Vertebres, and their tranſverſe Proceſſes are perforated, for the more commodious Paſſage of the Arteries and cervical Veins and they are ſeated in the Extremities, at the Exit of the ſoft Nerve. But the hinder Spines are bipartited for the more firm connexion of the Muſcles and Ligaments.

Their Subſtance is harder, thinner and leſs porous then that of the reſt of the Vertebres; within ſide alſo they are leſs gibbous and leſs in bulk then the reſt. The two uppermoſt are faſten'd to the Head with ſtrong Ligaments.

Atlas. III. *The firſt is call'd* Atlas, bearing up the head like a little World, and ſtrongly faſten'd to it. It is thinner and tougher then the reſt, and wants the hinder Spine, inſtead of which there appears a Protuberant Semicircular Inequality. It has two Apophyſes aſcending upwards, with two lateral ſomewhat deſcending and perforated. On the fore-ſide it ſhews a Protuberancy very ſolid and hard, from the ſides of which two upper and as many oblique Eminencies bunch forth. More inward at the fore-ſide of the great Hole, there is a Semicircular Cavity covered with a Griſtle, wherein it receives the Tooth of the following Vertebre.

Dentata. IV. The *Second*, call'd ὀδοντοειδὴς from *Turning*, ſends upward from the middle of it a hard and round Proceſs, long like a Tooth, about which the head is turned with the firſt Vertebre. Whence by *Hyppocrates* the whole Vertebre is called *Dens*, by others the Toothed Vertebre, by us the *Axle*. This toothed Proceſs is tyed with a particular Ligament, and faſtened to the hinder Part of the Head.

Note that this Tooth in new born Infants is not firmly united, but ſeems to be ſeparated from the reſt of the Bone, and placed upon it. But is afterwards ſo united to it, as if it had never been parted from it; ſo that in grown People it ſeems rather to reſemble a Proceſs than an Appendix.

On both ſides the Tooth there is a ſmall, ſmooth, flat place, under which lyes the lateral *Apophyſis* perforated.

In the fore Part a broad deſcending *Apophyſis* is received by the Cavity of the Inferior Vertebre. At the hinder Part on both ſides deſcends an *Apophyſis*, which the third Vertebre receives.

The hindermoſt Spine deſcending is bipartited.

The *Third* is by the *Greeks* erroneouſly called ἄξων, being a Name more proper for the ſecond Vertebre, whoſe Tooth reſembles an *Axle* both for its uſe and form. This on each ſide from the ſides backward ſends a hollow Apophyſis upward, where it receives the deſcending Apophyſis of the ſecond Vertebre, under this deſcends another, and to that another ſmall one aſcending upward adheres, thruſting it ſelf into the Cavity of the ſecond Vertebre.

Below it has a Cavity, whereinto it admits the following Vertebre; and the Spine growing forked is divided into two Extremities.

The Fourth is like the third, but wants a peculiar Name.

The Fifth differs little from the two former.

The Sixth ſomewhat bigger in Bulk, differs very little from the former, only that it has two upper *Apophy* more aſcending, and a larger Spine.

The Seventh which is the biggeſt of all, and its Spine longer and thicker, but not divided, is obtuſe with a round Head. The lateral *Apophyſis* of this wants the Eminency extended inward, with which the fourth, fifth and ſixth are provided.

Beſides theſe Seven, *Spigelius* avouches, that there is ſometimes, though ſeldom an eight allowed, eſpecially in thoſe that have long Necks; but then they have one Vertebre wanting in the breaſt, which for that reaſon is ſhorter.

V. ***The Vertebres of the Back are reckon'd to be twelve***; rarely one over or one under. *The Vertebres of the Back.* Theſe ſurpaſs the Vertebres of the Neck in bigneſs and thickneſs, but are leſs ſolid, and perforated with many holes for the paſſage of the Muſcles; they are like one to another, and provided with ſolid and continuous *Apophyſes*.

Their figure. The Bodies of theſe are Orbicular, ſlightly hollow'd within ſide and behind, to the end the Ligaments may be more ſtrongly knit, leaſt the Vertebres ſhould ſlip out of their places.

Greatneſs. The nine uppermoſt are almoſt equal in bigneſs, which decreaſes by degrees in the four lowermoſt. In like manner the Spines of the nine uppermoſt are large, pointed at the upper part; below ſomewhat broad; and the upper obliquely deſcend above the lower.

lower. But in the three lowermoſt the Spines are ſtreight, and carry'd outward, and become more obtuſe: the lowermoſt being hollow'd at the end with a ſlight ſuperficial Furrow.

Theſe Vertebres of the Back at this day are diſtinguiſhed by no peculiar Names; though Antiquity had ſeveral Apellations for them.

They are diſtinguiſhed from the Vertebres of the Neck, for that the Dorſal Spines are almoſt thick, long, ſolid and ſingle, nor divided at the ends, as are moſt of the Vertebres of the Neck: as alſo for that they have a Cavity on each ſide, into which the Head of the Ribs is joynted; which the Vertebres of the Neck want, though they have their tranverſe perforated Proceſſes which the Dorſals have not. The Vertebres of the Loyns alſo are deſtitute of thoſe hollowneſſes. Beſides thoſe Cavities in the Vertebres of the Back, there are two other Cavities in the tranſverſe Proceſſes, not deep but ſuperficial, appointed to ſtrengthen the Articulations of the Ribs, which nevertheleſs are hardly conſpicuous in the eleventh and twelth Vertebre.

Proceſſes. VIII. *The Dorſal Vertebres are provided with ſeven Proceſſes*; four oblique, two lateral or tranſverſe, and one pointed, which is called the Spine. Of the oblique, two aſcend and as many deſcend. They thruſt themſelves into the deſcending Proceſſes of the upper Vertebres. Theſe jet not forth very much, and are receiv'd by the ſmall Heads of the aſcending Proceſſes of the inferiour Vertebres. The tranſverſe Proceſſes of the three inferiour Vertebres, the tenth, eleventh and twelfth grow leſſer by degrees, and the Proceſſes of the eleventh and twelfth are ſomewhat forked.

Riolanus writes, that the eleventh and twelfth Vertebres differ from the reſt in the joynting, & are knit to the firſt Vertebres by Arthrody, whereas the reſt are articulated by Gyngliſm, which is a manifeſt Error; ſeeing that theſe are no leſs connexed by Gyngliſmus then the reſt, though the Articulation of theſe be broader then that of the others, becauſe that the Motion of the Spine in bending Extention and Obliquation is firſt to be performed in that place. In theſe Vertebres of the Back, we are to take notice of certain Cavities inveſted with a Griſtle which are wanting in the reſt; two in the tranſverſe Proceſſes, which the eleventh and twelfth however want; aud two in the Body it ſelf, to receive the Proceſſes of the Ribbs.

The Vertebres of the Loyns. IX. *The Vertebres of the Loyns are five*; ſeldom more or leſs. *Fallopius* writes, that he has many times obſerved that the number of the Vertebres of the Loyns varies according to the number of the Vertebres of the Back. So that if there be eleven Vertebres of the Back, there are ſix of the Loyns; if thirteen in the Back, then only four in the Loyns; if twelve, which is uſual, then no more then theſe five. But that this is no conſtant Rule appears by a Skeleton in the Cuſtody of Dr. *Pelt* in *Utrecht*, wherein there are twelve Vertebres of the Back, and ſix of the Loyns of a conſiderable bigneſs. Theſe Vertebres ſurpaſs in thickneſs and bigneſs all the reſt; and are provided with many little holes for the ingreſs and exit of ſmall Arteries and Veins, and they are joynted together with an intervening glutinous Griſtle, yet ſo that the conjunction of theſe is looſer then of thoſe of the Breaſt, for the more eaſie bending the Body. They have hinder Proceſſes ſhorter and leſs pointed but broader and thicker then thoſe of the Breaſt, and aſcending ſomewhat upwards; but the lateral Proceſſes are ſomewhat longer. In the mean time they differ ſomewhat in joynting from the Vertebres of the Breaſt; for that theſe are carried upwards with aſcending Proceſſes into the Cavities of the upper Vertebres; thoſe are joynted with lower Proceſſes at the ſide ſomewhat lower into the Proceſſes of the next Vertebre. But the twelfth Vertebre is not joynted into the upper Proceſſes, as the other Vertebres of the Breaſt; but into the lower, as the Vertebres of the Loyns.

The Bone Lus. X. Certain *Hebrew* Writers have feign'd a certain Bone between the laſt Vertebre of the Loyns and the *Os Sacrum*, which they call *Lus*, of which they ſcribble Wonders; which *Bauhinus* has Epitomiz'd in theſe Words. *The* Hebrew *Writers*, ſaith he, *Aſſert, that there is in the Body of Man below the Eight Rib a certain Bone, which cannot be corrupted or annihilated either by Water, Fire, or any other Element, nor can it be broken by any external force; which Bone God will at the laſt Judgment water with Celeſtial dew, and then the reſt of the Members ſhall unite together into one Body, which being inſpired with the Breath of God, ſhall be again enlivened. This Bone they call* Lus, *not* Luz; *which they ſay is ſeated in the Spine of the Back, behind the*

eight Vertebre at the Bone of the Thigh. The Author of this Fable is Rabi Uſkaija, *who liv'd in the Year of our Lord* 210. *who wrote a Book entitled* Be Reſchite Rabba, *being a Comment upon the Pentateuch.* But theſe are all Fictions and Fables, though *Agrippa* ſeems to favour them in his Occult Philoſophy.

The Os Sacrum.

XI. *The* Os Sacrum, *remarkable for its thickneſs and ſtrength, ſtands immoveable under the Vertebres, and like a Baſis ſupports the ſtructure of the Vertebres impos'd upon it.*

Within-ſide it is ſmooth and hollow, without-ſide convex and hollow, of a Triangular figure. Upon each ſide, at the upper Part, it has a plany place rough and unequal, where it is faſtened to the *Illion* Bones by means of a Griſtle.

It conſiſts of five or ſix Bones, reſembling the Vertebres, which being broad at the beginning, grow narrow by degrees; and though in Infants and Children they may be eaſily ſeparated, in men grown they unite into one Bone. *Fallopius* obſerves in Children new Born, that the Parts of this Bone conſiſts of three Particles, like the reſt of the Vertebres, which are afterwards ſo united, that there is no more Diviſion to be ſeen.

It is perforated with holes, not lateral, as the Vertebres, but tranſverſe, ſeated at the Exit of the Nerves forward and backward on both ſides, to the Conjunctions of the Parts, of which this Bone conſiſts, which within are much larger and bigger then without. It has ſmall Proceſſes, and Spines for the moſt Part looking upwards, ſo that the lowermoſt hardly appears.

The Coccyx Bones.

XII. *The Bone of the* Coccyx, *ſo called, becauſe it reſembles the Cuckows-bill, conſiſts of three or four little Bones, from a larger Baſe tending donward in a point by degrees, and bending within for the conveniency of ſitting.*

Fallopius obſerves that this conſiſts of three Bones, whereas the *Os Sacrum* conſiſts of ſix; but when the *Sacrum* conſiſts but of five, then the *Coccyx* conſiſts but of four.

In Children it is altogether Griſtly, till the ſeventh year: afterwards it begins to be conſolidated into a Spungy ſubſtance, and of four Particles to be united into one Bone.

This *Coccyx* adheres to the *Os Sacrum* like an Appendix, and is joyned to it with a looſe Connexion by means of a glutinous Griſtle; that it may be able to give way in the delivery and the exoneration of thick and hard Excrements, and to prevent its being injur'd by any violent Concuſſion. *Spigelius* and *Riolanus* believe, that if the ſaid knot happen to be over looſe, it cauſes a falling of the Fundament in Children; of which nevertheleſs there may be a more uſual and manifeſt reaſon given.

The uſe of it is to ſupport the ſtreight Gut, and the Sheath of the Womb in Women, which is faſtened to that Inteſtine.

A Pendulous Griſtle grows to the Joynt of it.

This *Coccyx* Bone, it being bent outward in length it grows dry, becomes a Tayl, as we ſaw it in the Year 1638. in an Infant new born half an Ell long, like the Tayl of an Ape; which was occaſioned by the Mothers being frighted by an Ape with a Tayl, after ſhe had gone but three Months. Thus *Pliny* tells us of ſome men that have woolly Tayls in ſome Parts of *India*. And *Paulus Venetus*, that in the Kingdom of *Lambri*, there are a ſort of Savage People, with Tayls like Dogs above a handful long. Theſe Teſtimonies *Harvey* very much confirms by the following Story. *A Chyrurgion* ſays he, *a very honeſt Man my Friend, returning from the* Eaſt-Indies, *told me that in the Iſland of* Bornea *in the Mountanous Parts remote from the Sea, there are a ſort of Men with Tayls, of which number he ſaw a Virgin that was taken with great difficulty, with a fleſhy thick Tayl about a Span long, which ſhe clapt between her Buttocks, and covered therewith her Podex and Privities.*

CHAP. XIII.

Of the Ribs.

TO the Spine above, adhere the Ribs, the *Os Sternon*, the *Clavicles* and *Scapula's*; below the nameleſs Bones.

The Ribs.

I. *The Ribs, that fortifie the Breaſt, are by the* Greeks *call'd* Pleura.

II. *Theſe*

Their Number. II. *Theſe are reckoned to be twelve on each ſide, ſeldom more or leſs.* *Galen* writes, that a thirteenth is very rarely to be found, and more unuſually eleven; which Number, *Columbus* once obſerved. Alſo in the year 1641. we obſerved eleven in a certain French Souldier that was ſlain with a Sword. *Riolanus* avouches that he has ſeen ſometimes eleven, ſometimes thirteen of a ſide. *Bartholine*, eleven on the one ſide, and twelve on the other. *Fallopius* has ſeen thirteen of a ſide, which *Picolhomini* ſaw twice; once *Bauhinus*, and once *Frederic de Ruyſch.* I have a Skeleton by me, which wants the twelfth Rib almoſt, on both ſides, I ſay *almoſt*, for that it is ſo ſmall, that it hardly exceeds a Thumbs breadth.

Their Subſtance. III. For their greater Strength, the Ribs for the moſt part, where they are carried along the Back and Sides, are bony, and within ſpungy; which is the reaſon that broken, they are more eaſily conſolidated by means of a *Callus*, then any other Bones. But in the foremoſt and leaſt part, where they proceed toward the *Sternon*, they are griſtly, for the more eaſie Motion of the Breaſt. Theſe foremoſt griſtly Productions in Women, ſometimes are harder, and as it were grow into Bones, perhaps the better to ſuſtain the Weight of the Breaſts, for in Men there is no ſuch thing.

In new born Infants, the Extremities, by means of which, they are joyned with the Vertebres, are griſtly, but in a ſhort time harden into Solidities and bony Firmneſs.

Figure. IV. *They are bent like a Bow, to give the Breaſt more room*; which Arching of the Ribs is more in theſe above than below.

Their outward Superficies is ſomewhat unequal, eſpecially about the Vertebres, where the Ligaments are faſten'd but the inner Superficies where the Membranes adhere to the *Pelura* is more ſmooth.

Greatneſs. V. As to their Length and Breadth, there is great Variety. The middlemoſt are longer and broader, except the firſt, which is broadeſt of all. Moreover they are ſometimes broader in one Man of the ſame Age than in another, though both of an equal Tallneſs. I my ſelf have two Skeletons, the one of a Man that was very tall, becauſe he had narrow and ſtreight Ribs. The other of a Perſon of low Stature, whoſe Ribs are broad, thick and very firm.

At their firſt Riſe they are all narrow, and ſomewhat round, and the nearer they approach to the Breaſt, the broader they are. They are thicker above than below, but in the lower Part flat.

In the lower inner Part there is ſomething of a Cavity, wherein they receive a Nerve, an Artery, and an Intercoſtal Vein.

Cutting for an Empyema. VI. This Cavity is conſiderable in the Inciſion of *Empyics*, for ſpecial care muſt be taken, leaſt the ſaid Intercoſtal Veſſels be injured, which as *Bartholin* directs, may be avoided if the Inciſion, which is uſually perform'd between the fifth and ſixth, or between the ſixth and ſeventh Rib, be made from the top to the bottom. Thus alſo *Otto Heurnius* taught us, who for that Inciſion requir'd a Kniſe with a keen Edge, but a flat Back; which he would have ſo held in operation, that the Back ſhould be toward the lower Part of the upper Rib, that is, the foreſaid Cavity, but the Edge-work downward toward the top of the lower Rib. But experience tells us, that all this is one Imaginary Theory. For the Ribs in a living Man, are not ſo far diſtant, that a Knife can well be thruſt in from the lower part of the upper, to the top of the lower Rib. And therefore to avoid injuring thoſe Veſſels, I order the Chyrurgions to make the Inciſion in the upper part of the ſixth or ſeventh Rib, at the full length of it, not aſcending to the Rib next above it. Some will ſay that this is the way to cut the Fibres of the Intercoſtal Muſcles athwart, as if they could ſcape by the firſt Inciſion. The Fibres of thoſe Muſcles are all oblique, and the inner thwart the outermoſt like a St. *Andrews Croſs.* So that which way ſoever the Inciſion be made, there's no way to avoid the hurting of the Fibres; neither is it much to be fear'd, for that the Wound in this Caſe is not great, and as Experience teaches us, eaſily conſolidated again.

Articulation. VII. *The Ribs are joyned behind into the Vertebres*, by the means of ſome intervening Griſtle, and are faſtned to them with ſtrong Ligaments, of which, ſome proceed to the *Sternon* Bone, others not.

The true Ribs. VIII. *The former are call'd true Ribs*, of which, the griſtly Productions are immediately faſtned to the *Sternon*, and are ſeven Superior, of which, the

the two first are call'd *Retorted*, the two next *solid*, and three lower call'd *Pectorals*.

The Spurious Ribs. IX. The hinder and lowermost are call'd the Spurious Ribs, of which, the first four, with their Cartilages winding backward, and mutually cohering together, are fastned below to the seventh Gristle of the true Ribs. But the last, which is the least, sometimes grows to the *Diaphragma*, sometimes to the right Muscle of the *Abdomen*; in which Connexion, it sometimes associates with it the last Rib, save one.

Their Use. X. The Use of the Ribs are,

1. To keep the Breast dilated, and the upper Part of the lower Belly; least in the one, the Heart, together with the Lungs; in the other, Liver, Spleen and Ventricle should be oppressed by the Weight of the Incumbent Parts.

2. To defend both them and other Parts therein contained from external Injuries.

3. To support the Respiratory Muscles, and assist their Motions; for which reason, the Breast ought not to consist of one Bone, as which would then have been immoveable; nor could the Act of Respiration have been conveniently perform'd, which is the reason that the Ribs very rarely grow together, which *Pausanias* reports of *Protophanes* the *Magnesian*, in whose Carcass all the true Ribs were found connexed. This *Protophanes* was a famous Wrestler in the *Olympic* Games. Now because a good Wind is necessary in Wrestling, which could not be by reason of that Connexion of the Ribs; 'tis very probable, that when he grew old, his Ribs stuck together, after he had left off Wrestling. As many times some Vertebres of the Back, Bones of the Skull, and other Bones become continuous when Men grow aged.

CHAP. XIV.

Of the Bone of the Breast and Sternon.

THE Bone of the Breast, in Greek στέρνον, in Latin *Sternum*, is placed before the Fore-part of the Breast, like a Bulwark, to which the gristly Productions of the true Ribs are fastned.

The Substance. I. *The Substance of it is spungy and less white than the rest of the Bones*, which in Infants seems to be altogether gristly, except the upper Part, which is sometimes more bony. Perhaps because the Articulation of the Clavicle is there to be fastned.

Its Parts. II. *In new born Infants, it seems to be compacted of seven or eight Bones, joyned together with a Gristle*; to the lowest of which, the Sword-resembling-Gristle, the single Pairs of the true Ribs are knit. But these after the Age of eight or ten years, unite together into fewer Bones by *Synchondrosis*. So that in People grown up, only three are to be found, rarely four, distinguished with transverse Lines; and these also when Men grow into years, become one solid Bone. *Riolanus* saw at *Rome* this Bone in a Girl of seven years old, consisting of eleven Bones; and the *Sternon* was divided into six Bones; but the five lower Bones appear'd every one divided into two Bones, from the bottom to the top, all the length of the Bone. This Sciſſure in the middle of all the Bones, except the uppermost and lowermost, is frequently to be observed, as *Eustachius*, *Bauhinus*, and *Bartholine* avouch.

The upper Bone, surpassing the rest in largeness and thickness, resembles the Pummel of the Handle of a Sword, having in the upper and middle Part, a Furrow like a Half-moon, call'd the little Fork or *Jugulum*. At the Side of which, on each side, stands another little Hollowness, to receive the Extremities of the Clavicles, and to be fastned by a Gristle. In the inner Part there is another Cavity, giving free Passage to the descending *Trachea*.

The second, or middle Bone, annex'd to the first by means of a Gristle, is narrower, but very long, and has five or six Cavities on both sides, at unequal distances one from another, and receiving the Gristles of the Ribs.

The Cartilagious Mucronata. III. The third Bone, which is lowest and least, ends in a Gristle, which resembling the Point of a Sword, is call'd *Cartilago Mucronata*, by the *Greeks*, the *Sword-resembling*, and vulgarly the *Buckler-like*.

This Gristle is oblong and triangular, equal in the breadth of the Thumb in length, and is seldom found double, but most commonly single; sometimes forked, for the Convenience of the Vessels passing through; sometimes round and thin, being perforated, it affords a free Passage to an Artery and a Vein.

But

But if both the Biforcation and the Hole be wanting, then the *Sternon* is perforated in the middle, which is chiefly obſerved in Women, according to *Riolanus*, who found in a Hole in a certain Woman, ſo broad in the inner Part of the *Sternon*, as to admit his little Finger. But the Breaſt of that Woman was fortified with thirteen Ribs of a Side. Thus *Euſtachius* and *Sylvius* obſerve, that the *Sternon* is ſometimes pervious in the middle, with a broad Hole for the Paſſage of the Veſſels. *Maſſa* aſcribes to himſelf the Diſcovery of this Hole.

Frequently this Griſtle is bowed back, ſometimes outward, ſometimes inward, not without great prejudice to the Stomach and neighbouring Parts, which cauſes the Hickopping, and an Acrophy, the Source of ſeveral Diſeaſes. Sometimes in old Men it turns to a Bone, which *Pavius* obſerved in one that had been long troubled with a Shortneſs of Breath. But it moſt rarely happens what *Veſlingius* obſerves, that this Muſcle in a certain Perſon extended it ſelf a whole Fingers length to the Navel, and became ſtiff, to the great Inconvenience of the Body in bending, and Prejudice to the Concoction of the Stomach, and Diſtribution of the Chylus.

Folius takes notice of two ſmall Muſcles placed at the ſide, and moving this Griſtle outward and inward; which I could never as yet find out.

The Scrobicle Cordis. IV. Without ſide, in the Region of this Griſtle, here is a Cavity to be ſeen, which the *Greeks* call κροδίαν, the *Latins* the little *Scrobicle*, or Hole of the Heart, becauſe that the Heart adjoyns to it within ſide, with its Bone included in the *Pericardium*, and annexed to the nervous Center of the *Diaphragma*.

Riolanus ſometimes found in fat Women with great Breaſts, the Bone of the *Sternon* acuminated by the weight of the Breaſts; which has ſtreightned the Breaſt, and cauſed a Difficulty of Breathing in the Perſons themſelves.

CHAP. XV.

Of the Clavicles *and* Scapulas.

THE Clavicles and Scapula's ſome refer to the Shoulder and Hand, becauſe the Arm is joynted to them; for which Articulation they ſeem to have been chiefly fram'd; whereas they afford no remarkable uſe to the Breaſt. But others, by reaſon of their ſituation, with more reaſon, number them among the Bones of the Breaſt, which method we ſhall follow.

The Clavicles. I. *The Clavicles, ſo called, becauſe that like a Lock, they faſten the Scapula to the Sternon*, by the *Greeks* are call'd κλεῖδες, becauſe they lock up the Breaſt. *Celſus* calls them *Jugula*, or little Yoaks, as reſembling the Yoaks of Oxen; and others call them *Ligulæ*, or little Tongues.

Number. II. *Theſe are two Bones, of which, one of each ſide hangs athwart over the upper Part of the Breaſt, between the Joynt of the Shoulder, and the Top of the Sternon Bone.*

Subſtance. III. *Their Subſtance is thick and Spungy*, eaſily broken by the violent Shogs of external Bodies; but by reaſon of its Laxity, the *Callus* ſoon unites it together again.

Figure. IV. *The Shape of it is long, and ſomething like a great* S; but more wreath'd in Men than in Women, for the ſtronger Motion of the Arm.

Connexion. V. *With one of their Extremities which is round, they adhere to the top of the Sternon Bone*; with the other which is flatter, they are knit to the Proceſs of the *Scapula*, where they produce the top of the Shoulder.

Each extremity is covered with a Muſcle, and by means of that unctuous Griſtle, they are both joyned after a looſe manner with ſtrong Ligaments by *Diarthroſis*.

They have both a Protuberancy, and two Superficial Cavities, from whence the Subclavial Muſcle, and part of the Pectoral Muſcle derive their Original. And on both ſides near the ends they grow rough, that the Ligaments thence proceeding may more firm-

firmly take hold of them. The moveable Griſtle, called *Clauſura*, there conſpicuous, does not grow to them, but is held faſt with Ligaments embracing the Joynt, the more eaſily to yield to the Motions of the Scapula and Arm.

The Uſe. VI. ***The Clavicles ſeem to be found to render certain Motions of the Arm more ſtrong and eaſie***; which is the reaſon that moſt brute Beaſts are deſtitute of them. But they are to be found in Apes, Squerrels, *&c.* that make uſe of their Fore-feet as of Hands.

The Scapula. VII. The *Scapula*, by the *Greeks Homoplate*, of each ſide one, lies upon the Dorſal Ribs like a Target, and is a broad thin Bone, in ſome meaſure triangular, ſomewhat hollow within, gibbous without, deſign'd not ſo much for the ſafety of the hinder Part of the Breaſt, as for the ſecure Articulation of the Shoulder with the *Clavicle*, and the Inſertion of the Muſcles.

It is ſeated between the firſt and fifth Vertebre of the Breaſt, ſeldom reaches to the ſixth.

Part of it being extended all the length of the Back, is called the *Baſis*; of which, there are two Extremities called the Angles, one above, the other below.

The Baſis is called the ſides of the Ribs, of which, the uppermoſt is the ſhorter and thinner, the lowermoſt the longer and thicker. The whole breadth of the *Scapula* is called the Table; of which, the External Part is Gibbous, the Internal Concave, to receive the Muſcle that dives into it.

The Proceſſes. VIII. ***Three Proceſſes belonging to the*** **Scapula.**

The firſt, extended through the middle of its Body, and reaching the top of the Shoulder, by reaſon it ſomething reſembles a Thorn, called the *Spine of the Scapula*, and the *Creſt*; the Extremity of which being connexed with the *Scapula*, by the Modern Anatomiſts is call'd *Acromion*, or the *Point of the Shoulder*. I ſay, the *Moderns*, for that the Ancients ſeem to differ ſomething in the Deſcription of the *Acromion*. For *Rufus Epheſius* ſays, that the *Acromion* is the coupling it ſelf of the *Jugular* and *Scapula-bone*. *Eudemus* ſays, that it is a ſmall little Bone, which in Children is altogether griſtly, and though this Griſtle hardens in time into a Bone, yet till the eighteenth year, contrary to the Cuſtom of other Bones, it retains much of its Griſtly Subſtance, and ſometimes grows ſo ſlightly together with the Spine of the *Scapula*, that in the middle Age it may be eaſily ſeparated, as *Galen* reports, happened to himſelf, and that he was a Witneſs of in another Perſon. *Hippocrates* alſo takes notice of this Bone, and of its Luxation, in which place he adds, that in the *Acromion* there is ſomething in Man which is different from other Creatures.

From both Parts of the ſaid Spine, a little Furrow extends it ſelf, by *Riolanus* called the *Interſcapulium*, the one above, the other below.

The ſecond is lower, leſs and ſharp, not unlike a Crows-bill, and hence called *Coracoides*; by others from its Form *Sigmoides*; keeps the Bone of the Shoulder in its Place, and prevents it from ſliping toward the Fore-Parts. For the Actions of the Hand tending all toward the Fore-parts, the Shoulder would ſoon be diſlocated, unleſs the Bone were retain'd by the *Coracoides*; which contributes ſo much ſecurity to this Joynt, that there rarely happens any Diſlocation in the Fore-part of the Shoulder; which *Hippocrates* obſerved once, and *Galen* teſtifies, that he ſaw four times at *Rome*, and which I ſaw ſome years in an old Man, that put his Shoulder out of joint by a fall, which I ſet again.

The third is the ſhorteſt of all, called ἀυχὴν, or the *Neck*, within its own Cavity, ſtrengthened with a Muſcle, receives the Extremity of the Shulder-bone, being enlarged with a thick griſtly Brim, encompaſſing the Lips. This in new born Infants conſiſts of a more obtuſe and ſhorter, but griſtly Bone, which grows longer, as the Child grows in years. To theſe there are ſome proper Additions, as well as ſome peculiar Ligaments, with which the *Scapula* is faſtned to the Clavicle and Shoulder-bone.

According to the large or leſſer Bulk of the *Scapulas*, the Shoulders are either broader or narrower. Broad-ſhouldered Men are thought to beget more luſty Children. The narrow-ſhouldered, more weakly. The uncertainty of which Opinion, dayly Experience teaches us. *Therefore*, ſays Peter Foreſtus, *This is an Obſervation among the Women, that broad-ſhoulder'd Men beget a great many Children. And therefore my Siſter-in-law, who had twenty Children by her Husband, would never marry her Daughters to broad-ſhoulder'd Men.*

Riolanus

Riolanus reports, that the French Virgins have generally the right *Omoplate* higher than the Left; for which he says it is a hard thing to give a Reason. In our Low-Countries, I observe, that they who in their Childhood and Youth most violently exercise their Right-arm, their Right-Scapula stands more out from the Ribs than the Left.

CHAP. XVI.

Of the Nameless Bones.

TO the Spine, at the lower Part, adhere the *Anonymous* or *Nameless Bone*; of which, one of each side is knit to the sides of the *Os Sacrum* by the means of a Gristle with a strong Ligament. They are called *Nameless*, because they alone want a Name, whereas all the rest have Names given them.

Their Construction. I. *Each of these are constituted of three Bones*; the *Ilion*, the *Hip-bone* and *Share-bone*, firmly knit together with Gristles; which in Infants may be parted with a thin Knife, and the bounds of those Divisions remain conspicuous till seven years of Age; afterwards the Gristle drying up, they unite into one Bone; which being joyn'd on both sides with the *Os Sacrum*, makes the Bason, or that Cavity, wherein the Womb, Bladder and part of the Intestines is contain'd.

The Os Ileum. II. The *Ileon-bone*, so called from the Intestine next to it, is the upper and broadest Part of the *Nameless Bone*. It has a remarkable Spaciousness, and somewhat concave, taking its Name from the Rib. It is semicircular, but uneven, whose extream Parts, before and behind, are by some called *Spines*, *Brows* and *Lips*; but the outermost Part of the Bone is called the *Back*. This Bone, besides the foregoing Gristle, is fastned with a strong Ligament, membranous and common to the *Os Sacrum*.

The Os Coxendicis. III. The *Hip-bone*, or *Ischium*, is the lower and outer Part of the Nameless-bone, thick and firm. In this there is a large, profound and smooth Cavity cover'd with a Gristle, call'd the *Acetabulum* and *Pyxis*, into which the Globous Extremity of the Thigh-bone is fixed, out of which if it happen to slip, it causes a Dislocation; which Nature willing to avoid, has fasten'd these Bones with a double Ligament proceeding from the *Os Sacrum*. The Gristly Process of this Cavity, enlarging the *Acetabulum*, is called the *Eye-brow*, which is bigger behind than before; to the end that when we sit, the Thigh may be the more commodiously bent into an acute Angle. But it fails where the Cavity looks toward the Share-bone, by reason of a Blood-bearing Vessel passing that way, which brings Nourishment to the Joynt. But in the inner Cavity, there is a Hollowness somewhat rough and unequal, to which that Ligament obstinately adheres, which binds the Head of the Thigh-bone to the inner Part of the *Acetabulum*. Also two Protuberances are to be observed; *one*, internal, from whence the second or Right Muscle extending the Leg derives its beginning: The other *External*, which is sharp, and into which the Ligament is inserted, which rises from the fifth Process of the *Os Sacrum*.

The Os Pubis. IV. The *Share-bone*, called *Os Pubis* and *Pectinis*, is the foremost and thinner Part of the *Nameless Bone*, which is pervious with a large Hole seated between the Hollowness of the Hip, and its own Fore-parts; and by means of a Gristle, is firmly knit with its own Pare, and hollow'd above for the Descent of the Crural Vessels. This Hole affords a Seat to two Muscles of the Thigh; withoutside to the External, withinside to the Internal Obturator, or to the second and third circumvolving Muscles, which are distinguished one from another by a strong Ligament, that stretches under the Hole; which Connexion aforesaid of the Share-bones between themselves, with a Membranous Ligament, *Vesslingius* affirms, and *Riolanus* denies.

Now as to these inferior Bones, there is a difference to be observed between them in Men and Women.

1. The *Os Sacrum*, in Women is hollowed much more outward, to give more room for the Birth in time of delivery, for which reason the Huckle Bone adheres to it with a looser Connexion then in Men.

2. The lower Parts of the Hip-Bones and Share-bones in Women are produced farther outward, and make the Bason larger.

3. The *Ilium Bones* are much larger and more hollowed, and their Spine more advanced to the Sides in Women than in Men.

4. The Griſtle that faſtens the Share-bones, to the end it may be the better diſtended, in Women is twice as thick and twice as looſe as it is in Men, eſpecially if they have brought forth Children; moreover the Line by which the Share-bones are joyned, is ſhorter in Women than in Men.

Here two Queſtions ariſe: The firſt, Whether the Share-bones are moved? The ſecond, How it is poſſible a mature and large Birth ſhould come forth in delivery through the narrow Paſſages of the Baſon, every way beſet and ſtuft with Muſcles and other Parts?

Whether the Share-bone parts?

V. As to the firſt Queſtion, *Spigelius*, *Cajus* and *Riolanus* maintain the Affirmative, who avouch theſe Bones to be moved upwards and downwards by the help of the Muſcles, which they ſay is apparent in venereal Congreſs and Leaping. But they ſhould have ſaid that theſe Bones are moved either of themſelves, by the help of the Muſcles inſerted into them, or by accident, as in ſome meaſure they follow the Motion of the adjoyning Parts. The firſt is falſe; ſeeing theſe Bones are immoveably joyned together by Symphyſis, except only at the time of Delivery, at what time the Griſtles being moiſtned and looſned, they become ſomewhat moveable, and give way a little one from the other. The latter is true, for upon the Motion of the Thigh, Back and Loyns, it is certain that theſe Bones move with the whole Nameleſs Bone, but not ſeparately by themſelves.

How the Birth gets out of the Pelvis?

VI. As to the ſecond Queſtion, if the Birth be but ſmall, it may paſs through thoſe narrow Paſſages without any great Trouble, as daily Experience evinces. For at the time of Delivery, the general Parts through the plentiful Afflux of Humors, become ſo looſe, ſoft and ſlippery, that they will admit the whole Hand of the Midwife or Chyrurgion. But if the Birth be large, and that the Womans Parts are naturally ſtreight of themſelves, then the Delivery proves tedious and painful, and the Share-bones, the Ligaments and Griſtles being moiſtned will open ſomewhat wider; nay, the Griſtly Connexion of the *Os Sacrum*, with the Bones of the *Ilium*, will be ſo looſned, that they manifeſtly give way one to another; which Dehiſcency of the ſaid Bones, the firſt that obſerved among the Ancients, were *Hippocrates*, *Avicen* and *Ætius*; among the Moderns, *Pineus*, and ſeveral other eminent Phyſitians. *Alexander Benedictus* writes, that if the Birth be large, thoſe Bones open of themſelves, and the *Pecten* and the *Os Sacrum* conſent to the Expulſion; alſo that thoſe Bones after Delivery, return by degrees to their natural Place, and that the reſiſtance of one or more of theſe is the cauſe of difficult Labour, though the reſt anſwer the whole. *Fernelius*, among the Cauſes of difficult Labour, reckons the firm Compaction of the *Share-bones*. *Gortheus* aſſerts, that the very Hips of Women in Travel are divided, which cauſes violent Pains in the Loyns and Hips. However, though theſe Bones are divided and gape, yet they are not diſlocated, for they would never recover their Priſtine Eſtate. But this confirmed Opinion of the Ancients and Moderns, *Columbus*, *Rodricus a Caſtro*, *Volcher*, *Fuchſius*, *C. Stephanus*, *Cordeus*, but chiefly *Laurentius* endeavours to refel, contrary to all the Documents of Experience, the moſt certain Miſtreſs and Inſtructreſs in all things. *Pareus* profeſſes, he thought the Bones of the Ilion and Share-bones could not poſſibly be divided in Delivery; but he was convinc'd by the Diſſection of a Woman hang'd fourteen Days after ſhe was brought to Bed, in whom he found the *Ilion* divided from the *Os Sacrum*, and the Share-bones diſtant half a Fingers breadth from one another. *Bauhinus* produces two remarkable Obſervations concerning this Matter. And *Riolanus* reports, that he has thirty times obſerved in Women that have dy'd in Child-bed, that the Griſtle which binds the Share-bone, has been divided the breadth of the Little-finger, and that you might by handling feel the Gaping of the Share-bones, and that before Diſſection, he has perceiv'd the Share-bones moveable by lifting up one Thigh; and obſerved that one advanced it ſelf above the other. Says *Harvey*, *Upon my own Experience I aſſert, that the Share-bones are oft looſened in Labour, their Griſtly Connexion being ſoftned, and the whole Region of the Hypogaſtrion enlarged, to a Miracle; not from the Effuſion of any Watry Subſtance, but of their own accord, as the Baggs open to ſhed the ripe Seeds in Plants.* *Spigelius* aſſerts the ſame, upon the Experience of ſeveral Diſſections. And upon the Diſſection of a Woman that dy'd in Child-bed, I my ſelf publickly ſhew'd the Share-bones ſo far divided one from the

the other, that you might put your little Finger between them. Which is the reaſon that Women in Labour frequently complain of ſharp pains about their Share-bone and the *Os Sacrum*, and that the ſaid Griſtles are thicker then ordinary in Women that have often lain in; and that old Virgins in whom theſe Griſtles are dry'd if they happen to Marry and bear Children, have hard Labours: Laſtly, becauſe that although the reſt of the Griſtles of the Body grow dry, and in many Parts become Bony, yet in Women they never grow dry nor harden into Bones. *Riolanus* writes, that this deduction of the *Ilion*, *Os Sacrum* and Share-bone not only happens in difficult but alſo in the moſt eaſie Labours; which however I believe is much to be queſtion'd. For that I have obſerv'd more then once, Women that have been ſuddainly brought to Bed of little Children yet mature Births with little or no pain, either in their Beds or ſitting in their uſual Chairs, and that without the help of a Mid-wife, in whom I could not perceive the leaſt Divulſion of the ſaid Bones; which otherwiſe by the Diſtenſion of the adjoyning Membranes, muſt have caus'd great Pains, nor is it probable, that theſe Bones can be parted aſunder but by ſome ſtrong and violent Effect of a large Birth ſtriving for Paſſage. For that ſame Griſtly Connexion is too ſtrongly knit to be eaſily diſtended.

CHAP. XVII.

Of the Bones of the Arm, that is to ſay, of the Shoulder and Elbow.

THE Bones of the Hand belong either to the Shoulder, the Elbow, or the External Part of the Hand.

The Shoulder-bone.

I. *The Shoulder-bone is one Bone great, ſtrong, round and uneven, in the hinder Part toward the Elbow ſomewhat depreſs'd, and flat.*

The upper Part of the Bone has a great and Globous Head, fortified with a Muſcle, by means of which it is joynted with the *Scapula* by that ſort of *Diarthroſis*, which is call *Arthrodie*; but becauſe the Cavity is not conveniently proportionated to receive the Head; hence the Lips of it are enlarg'd with a ſurrounding Griſtle.

A little lower round about the Head are ſeveral manifeſt Holes, through which the Blood-bearing Veſſels penetrate inwardly for the Nouriſhment of the Marrow. *Riolanus* writes, that there is a wide Hole in the Shoulder-bone in all Men about the middle and inner Part, penetrating the Subſtance of the Bone for the Paſſage of the Veſſels. But I do not find this Hole in any of my Skeletons; and therefore I do not believe it to be in all, but only in ſome few.

The foreſaid head of the Soulder-bone is an *Epiphyſis* or an *Appendix*, which in Men grown beomes a Part of the Bone, or elſe a Proceſs of it.

This Shoulder-bone is faſtened to the *Scapula* by the means of a thick and nervous Ligament, which embraces the whole Joynt. Moreover there are three Muſcles, the Spine above, the Spine below, and the *Subſcapulary*, which with their broad Tendons ſurround the Articulation: and under the *Deltoides* there is a broad and remarkable Ligament which is extended from the *Deltoides* to the *Acromium*, to prevent the Brain above from being diſlocated into the upper Part.

At the head of the Shoulder-bone in the hinder Part ſtand two Protuberances rough and unequal, to which very ſtrong Ligaments are faſtened: alſo two Cavities, one Internal and orbiculated, the other at the ſide of the Head being the Original of the Ligament: The other External and Oblong, diſtinguiſhing the ſaid Protuberances, and being the ſeat of the beginning of the two-headed Muſcle.

More below it is articulated with the Elbow by *Ginglymus*; which Articulation, becauſe it ought to be made with the harder Bones the *Ulna* and *Radius*; hence in its Extremity which is covered with a Griſtle, it has three Proceſſes, the upper indifferent, the ſecond leſs, and the loweſt, the largeſt of all; between which there are two Cavities, ſo that together they reſemble a little Wheel for the twiſting of Ropes; and about this Extremity of the Elbow the Bones are rouled.

At the lowerſide of the bigger Proceſs, there is another large Proceſs, diſtinguiſhed from it by an intervening

Cavity, which in living People is eaſily apprehended by External feeling, from whence the Muſcles are produc'd.

Next to that Wheel reſembling Extremity, in the hinder ſeat, there is one large and deep, in the foremoſt ſeat two larger Cavities appear, which receive and curb the Bones of the Elbow, while they are moved forward and backward.

It has two little holes about the Heads, eſpecially about the upper Head, to give paſſage to the Veſſels for the Nouriſhment of the Bone.

The Elbow. II. *The Elbow is compos'd of two Bones mutually reſting one upon another*, ſo that they are joyned at the Extremities, but in the middle are ſeparated one from another, though coupled with a Membranous Ligament. Partly for the more expeditious motion of the Member, partly for a place of ſecurity for the manifold Muſcles of the hand.

The Ulna. III. *The firſt of theſe Bones, which is the lower and longeſt is called* Ulna; *by the* Greek Pechys; *by the Antients* Cubitus *and* Os Cubiti.

In the upper Part it is more large and thick; and toward the Hand by degrees it is attenuated into an Edge; and to the end of it there grows a round protuberance, with a leſſer proceſs ſomewhat ſharp-pointed, which is called *Styloides*, where it is knit by *Arthrody* with Ligaments, to the little Bones of the Wriſt, having a Griſtle going between. Above it is joynted to the Bone of the Shoulder by *Glynglymus*, and to that end it has two Proceſſes; of which the foremoſt, which is the leſs enters the inner Cavity of the Shoulder Bone; the hindermoſt which is the bigger, longer and obtuſe, enters the hinder Cavity of the Shoulder bone, and is ſtopped therein, ſo that the Arm cannot be extended beyond ſtreightneſs, nor moved backward. Both theſe Proceſſes in new born Infants are Griſtly, however the foremoſt ſooneſt becomes Bony, the hindermoſt not till ſeven years old. To theſe approach two Cavities covered with a Griſtle of which the lateral and leſſer, receives the Head of the *Radius*, the other which is the hindermoſt and larger, is roul'd about the Wheel of the Shoulder like a Semicircle.

The Radius. IV. *The other Bone of the Elbow called the* Radius. The upper Extremity of this is leſs, and being provided with a round Head, is admitted by the *Ulna* at the ſide. But at the top it has a round Cavity, which admits the head of the Shoulder, and is articulated with it by *Diarthroſis*. The lower extremity which is the thicker, receives the *Ulna*, at the ſide with a ſmall Cavity fortified with a Griſtle; and more below, with a double Cavity covered likewiſe with a Griſtle it admits the two firſt, and uppermoſt little Bones of the Wriſt.

Their uſe. V. *Theſe ſeveral Bones have all their ſeveral uſes.* The Elbow, by the help of the Muſcles cauſes bending and extention; bending in an acute Angle, and extention only in ſtreight Line, which it does not exceed. The *Radius* turns the hollow of the Hand either upward or downward.

Their Connexion. VI. Theſe Bones are knit one among another with a different Articulation; for the Elbow at the upper Part where it is broadeſt receives the *Radius*; and ſo they are bound together with a long Ligament which ſeparates the External from the Internal Muſcles, and riſes from two acute Lines that mutually look one toward the other; the one being in the inner ſide of the Elbow, the other in the inner Part of the *Radius*.

CHAP. XVIII.

Of the Bones of the lower Part of the Hand.

THE Hand is all that which depends upon the Elbow and the *Radius*, and is diſtinguiſhed into three Parts, the *Carpus*, *Meta-carpus*, and Fingers.

The Carpus. I. *The* Carpus, *which is the upper Part of the Hand conſiſts of eight little Bones differing ſomewhat in bigneſs and Figure, diſpos'd in a double order*; which in new born Infants not having yet acquired a Bony hardneſs, ſeem to be Griſtles; but afterwards harden into Bones ſomewhat Spungy, faſtened together with a ſtrong

ſtrong Ligament as well Spungy as Griſtly; as alſo with another common Ligament, appointed for the binding of theſe Bones, and for the preſervation and ſtretching of the Tendons of the Muſcles to the Fingers.

The Articulation. II. Of theſe little Bones the three uppermoſt are faſtned to the Elbow and *Radius* by *Arthrody*. The fourth out of its order, ſtands outward next the Third; the other four placed more below, are joyned with ſo many Bones of the *Meta-carpium* by *Synarthroſis*.

They have two ſurfaces covered with a ſlippery Griſtle. One outward which is gibbous; whereunto they are admitted by the Cavities of the Neighbouring Bones. The other inward and hollow, into which they receive the Protuberances of the adjoyning Bones. Sometimes near the connexion of the Eight Bone of the Wriſt, with the Bone of the *Metacarpium*, ſuſtaining the Little-finger, there is found a little Bone, which fills up the empty ſpace in that Part. Which *Veſalius* ſeems to number among the *Seſamoides*.

The Metacarps. III. *The* Metacarpium *conſiſts of four long Bones, ſlender, hollow within, full of Marrow, parted in the middle region for the more ſecure aboad of the Inter-bony Muſcles.* The firſt of theſe is annexed to the Fore-finger, being the longeſt and thickeſt, the reſt by degrees become thin and ſhorter.

They have pretty broad upper Appendixes, the Cavities of which receive the little Bones of the Wriſt, and the lower which tack them to the Cavities of the Fingers.

The Fingers. IV. *The* Phalanx *of the Fingers, the Thumb being numbred in, conſiſts of fifteen Bones*; for that three compleat every Finger, different in bigneſs of which the firſt and largeſt is covered with the ſecond, the ſecond with the third, and the third with the Nail. It is gibbous without, plain within, and ſomewhat hollowed, for the more commodious comprehending the ſolid Bones.

They have Proceſſes above and below.

The uppermoſt are round, and have one round hollowneſs, in each of the firſt four Bones, receiving the Bone of the *Meta-carpium*. The reſt are provided as it were with a double Cavity diſtinguiſhed with a ſmall Protuberance.

The lower Proceſſes put forth as it were a double head, diſtinguiſhed by a Cavity, with which they enter the double Cavity of the impoſed Bone; except the third and laſt Bone, which is only fenced with the Nail. All theſe Cavities and Proceſſes to facilitate motion are covered with a Griſtle.

CHAP. XIX.

Of the Bone of the Thigh and Leg.

THere are three Parts of the Foot, the Thigh, Leg and extream Part of the Foot.

The Thigh. I. *The Thigh called Femur*, in *Greek* μηρὸς, conſiſts of one ſtrong Bone, in length and bigneſs exceeding all the reſt of the Bones of the Body, round and ſomewhat gibbous before; behind ſomewhat depreſſed and hollow, marked with a rough Line obliquely deſcending toward the Knee.

The Head of the Thigh. II. The upper Part has a thick Proceſs prominent toward the Hip-bone, with a round and large *Epiphyſis* impoſed upon it, and ſo compoſes the gibbous head of the Thigh, underpropt with a ſtrong Neck, which being overcaſt with a Griſtle is hid up in the *Acetabulum* of the Hip, and there faſtened with two ſtrong Ligaments; one broad, thick and Membranous which encompaſſes the whole Joynt; the other round, which being produc'd from the Cavity it ſelf of the *Acetabulum* is inſerted into the received head of the Thigh, and faſtens it moſt firmly to the *Acetabulum*; and thus this Articulation is perfected by *Enarthoſis*.

An Obſervation. III. Concerning this *Epiphyſis*, *Rolfinch* obſerves, that it adheres with a very looſe connexion to the Bone of the Thigh; ſo that being boyl'd in Water it ſuddainly becomes ſoft, and is eaſily ſeparated from the Bone, eſpecially in young Animals; for which reaſon it is in Infants and Children eaſily ſeparated from the Bone, upon any ſlight occaſion; as when Children are ſet to go too ſoon by their Nurſes and then it is taken for a Diſlocation, and that Error prevents the Cure. This

brings

brings to my Memory that once or twice I saw this Recess of this *Epiphysis* from the Thigh Bone, which the Chyrurgions took for a Luxation, though the head could by no means be perceived to be slipt out of the *Acetabulum*. Only the Thigh-bone was turn'd back toward the hinder Parts, and the upper Part was perceived to ascend without a head, and so one Thigh became shorter than the other. But no body then thought of the Recess of the *Epiphysis*, which now I find was the cause.

Below the Neck, where the Bone begins to grow broader, two Processes are produced, provided with their *Epiphysis*'s, which are manifestly conspicuous in Children, but afterwards become Bony, and are united inseparably to the Leg, without any seeming diversity of the Substance. One of these Processes, the upper and bigger, bend upward towards the Exterior Parts: The other lower and far less, having the figure of an obtuse Tubercle, looks backward toward the inward Parts; which *Riolanus* believes to be rather an *Apophysis*, then an *Epiphysis*. That is called the bigger *Trochanter*; this the lesser *Trochanter*: To this lesser for the most part there joyns toward the outer Parts, another lesser Tubercle in a place somewhat lower. These Processes afford Insertion and rise to several strong Muscles.

Below where the Thigh-bone grows thicker, by degrees with its *Appendix*, it forms two large Heads, of which the outermost is thicker then the innermost: These being overcast with a Muscle it enters the double Cavities under the Leg, which are fortify'd likewise with a Muscle. Between those Heads it has another Cavity, small before, large behind, through which remarkable Vessels are carry'd to the Legs together with the fourth Nerve of the vast Pair. Between these Cavities the Protuberancy of the Leg is admitted, and so that Articulation is compleated by *Gynglymus*, while they also receive these two heads of the Leg.

Moreover there are two other little Cavities at the side of each Head, into which the Tendons of several Muscles are inserted.

The Sesamina Poplitis.

IV. *More behind in the Ham, the two Sesamoides Bones are plac'd to the lower Appendixes of the Thigh*, which grow to the Heads of the two first Muscles moving the foot; whereas otherwise the rest of the *Sesamines* stick to the Tendons of the Muscles.

The Patella.

V. But because the Articulation of the Knee was not yet strong enough, but that through the motion of the Leg or by any external violence the Bones might slip out of their place, therefore there is a round and broad Bone placed upon the Joynt, like a Circular Platter, by the Latines call'd *Molæ*, *Patella*, and by others *Rotulæ*, of a Gristly substance in Children, which afterwards becomes Bony, and to facilitate its motions is overcast within-side with a Gristle. This Bone adheres to the Tendons of the Muscles, with a looser connexion, it being requisite that it should not be two streight ty'd, to prevent an easie Luxation, and yet not hinder the Motion of the Muscles.

The necessity of this Office *Galen* observed in a certain Young Wrestler, whose little Platter being dislocated, ascended toward his Thigh; whence happened a dangerous bending in the Knee, so that he could not walk down a Hill without the help of a Staff. The same thing I have also observed in my Practice upon the like Accident. And though *Paræus* asserts that he never saw any Man halt, who had broken that Bone; yet I knew a Young *German* Nobleman, whose *Platter* was shot away with a Musket Bullet, so that he could not so much as go. Yet a Bone-setter here in *Utrecht* fitted a certain Iron Instrument to his Knee, which bending the Thigh-bone in Conjunction with the Leg, in some measure supply'd the loss of the Knee-pan, so that with the help of that Instrument he could walk indifferently, but when that was off he could not move his Foot, nor stand a moment.

The Leg.

VI. *To the Thigh is annexed the* Crus; being that Part which extends it self from the Knee to the Heel.

This is compos'd of two Bones very much differing in thickness and bigness, cohering together above and below; but parted in the middle, by reason of the Muscles of the Feet, yet connexed with a strong interceding Ligament.

The Tibia.

VII. *The first of these is by the Greeks called κνήμη, by the Latines* Tibia; *vulgarly* Focile Majus; and is a large and strong Bone, in some measure Triangular, in the Fore-part at its

its full length forming an acute Spine with the point of its foremoſt Angle; in which Part it is alſo void of Fleſh, only is covered with a *Perioſteum*, a fleſhy Membrane, with a little Fat ſcarce viſible, and the Skin. And this is the reaſon that Contuſions of the inſide of the Skin, are painful in the Cure, becauſe of the wound in the Fleſhy *Panicle* and *Perioſteum*, cover'd neither with Fleſh nor Fat to any conſiderable meaſure.

At each end it has a thick and remarkable Appendix.

The upper remarkable for its bigneſs, is divided behind with two heads; and at the Top being hollow'd with two long Cavities, fortified with a ſlippery Griſtle, receives the lower Heads of the Thigh; which ſaid Cavities are ſurrounded with a Griſtle, thick, moveable and almoſt ſemicircular *Limbus* for the ſtrengthning of the Articulation.

Between theſe Cavities riſes a little Hillock, as 'twere a Fence which is received by the Cavity of the Thigh-bone, from the rough and hollow top of which Hillock proceeds a ſtrong Ligament, which is faſten'd to the hollowneſs of the Thigh, and ſtrengthens the Joynt above all the other Ligaments

The Malleſtus internus. VIII. The lower Appendix is leſs then the other, Protuberating with a remarkable Proceſs to the inner ſide of the Foot, which is covered with no Fleſh, and called the *Internal Malleolus*.

This is provided with two Cavities: one lateral and leſſer, to which the Button joyns; the other lower, but large diſtinguiſhed with a ſlight Protuberancy into two Cavities; and overcaſt with a Griſtle, which receives the Heel-bone or Talus that lyes under, which receives the Shin-bone into its Cavity, and thus Articulation is compleated by *Ginglimus*.

The Fibula. IX. *The other Bone of the Leg is called* **Fibula**, the Button, and is faſtened outward to the Shin-bone, not inferior to it in length, but much ſlenderer and weaker; hollowed all the length of it with various Cavities for the Inſertion of the Muſcles, and rough with many Prominent acute Lines.

It has two Heads, one above, the other beneath, to which the Appendix grows, and they terminate in a Proceſs acute and ſomewhat rough.

With the upper Part it does not riſe ſo high as the Knee but ſtops below the Appendix of the Shin-bone, and receives it into a ſlight hollowneſs.

More below the Button is received by the hollowneſs of the Shin-bone, and ſends forth a Tuberous head with a Proceſs to the ſide of the *Talus*, conſpicuous without, where it is called the *External Malleolus*; and is lower then the Internal. *The* Malleolus externus.

CHAP. XX.

Of the Bones of the Extream Foot.

THere are three Claſſes of the Bones of the Extream Foot; the Bones of the *Tarſus*, or *Pedion*, of the *Meta-Tarſus*, or *Meta-Pedion*, and of the Toes.

I. *The Tarſus conſiſts of ſeven Bones differing in ſhape and bigneſs.* *The* Tarſus.

II. *Firſt, the* Aſtragalus *or* Talus, which enters the lower hollowneſs of the Leg, with a Head ſomewhat convex by the Proceſs of which conſtituting the inner *Malleolus*, it is comprehended within, as by the Button without, and conſiſts of ſix ſides. *The* Talus

It looſes its Prominency before, where it joyns to the Bone of the Heel.

Moreover it has a large Cavity in the lower middle hollowneſs, to which a like Cavity of the Heel is oppoſitely placed. In theſe little Cells an unctuous ſlime is preſerv'd, to moiſten the Ligaments and Griſtles.

III. *The Second Bone is called* **Calx** *or* Calcaneus, the biggeſt Bone of the *Tarſus*, oblong toward the hinder Parts for the more firm fixing the Foot, and to keep a man from falling backward. *The Calx.*

To the hinder Part is faſtened to a moſt ſtrong Chord, made of the Tendons of the three Muſcles that extend the Feet. More upward it enters with a large and flat Head into the hollowneſs of the *Talus*; and more forward admits the Protuberances of the *Talus* into its own hollowneſs. At the inner ſide it has a large hollowneſs through which the Tendons and large Veſſels deſcend ſecurely to the lower Parts of the Foot. At the outer ſide it is uneven with little ſwel-

lings

lings here and there, for the firmer Collection of the Ligaments and Tendons.

The Os Naviculare. IV. *This is the* Navicular *Bone or Boat-reſembling Bone, called* σκαφοειδὲς. This behind receives the *Talus* into a large hollowneſs; before with the flat Heads of three little Bones, it enters the hollowneſs of the *Talus*, a thin Griſtle going between theſe Conjunctions.

The Os Cuboides. V. *The fourth is called the* Cuboides *Bone, alſo* Os Teſſera, by the *Greeks Polymorphus*. This being bigger then the reſt of the lateral Bones, is placed before the Heel, and is joyned to it with an uneven ſuperficies: on the other ſide it is joyned to the third Wedg-like Bone; but toward the Toes, it is faſtened to the fourth and fifth Bone of the *Matatarſus*.

The other three had no Names given them by the Antients. However *Fallopius* gives them the Names of *Sphenoides*, *Calcoides*, and *Cuniform*. The firſt of theſe is bigger then the third; and the middlemoſt is the leaſt.

Many times at the External ſide of the Articulation of the Wedg-form'd Bone with the fifth Bone of the *Meta-Pedion* ſupporting the little Toe, a little Bone is obſerved at the Inſertion of the Tendon of the eighth Muſcle of the Foot: as alſo ſometimes a bony Particle, joyned to the Cube-faſhioned Bone, ſomewhat before, and filling up its Cavity, and adhereing to the Tendon of the ſeventh Muſcle of the Foot; which being both preſent at a time ſeem to ſtrengthen the Foot exceedingly. But *Bauhinus* reckons this among the *Seſamoides* Bones.

All thoſe Bones of the *Tarſus* in new born Infants, are rather Griſtly than Bony: but in time require a ſolid Subſtance like a Pumice-ſtone, full of little holes; which hardneſs ſome acquire ſooner ſome later; and are joyned together and to the Neigbouring Bones, with ſtrong Ligaments, and ſtrengthened with Griſtles for their Connexions.

The Metatarſus. VI. *The* Metatarſus, *called by the Greeks* Pedion, *by* Celſus *and others* Planta *and* Pecten, conſiſts of five ſtrong fiſtulous Bones, differing in length and thickneſs, ſeparated from each other in the middle, to make room for the Interbone Muſcles.

Above and below they protuberate forth with their Heads: Of which thoſe that are thicker and next the *Pedium* receive the four lower Bones of the *Tarſus* into their hollowneſſes: the other, which are provided with round Protuberances, are admitted into the hollowneſſes of the Toes.

The Bones of the Toes. VII. *The Bones of the Toes are numbered to be fourteen, among which the two Bones of the Great Toe excell the reſt in bigneſs.* The reſt of the Toes conſiſt each of them of three Bones, whoſe form and conexion agree with the Bones of the Hand, only that they are leſs.

All theſe Bones of the *Metatarſus* and Toes, for the facilitating of their Motion are overſpread with a Griſtle, about the Extremities where they are joynted.

CHAP. XXI.

Of the Seſamoides *Bones and the Number of all the Bones.*

THE *Seſamoides Bones*, reſembling the Grains of Indian Wheat, are certain very round ſmall Bones, ſomewhat flat and ſpungy within.

Their Situation. They adhere at the Joynts to the Tendons of the Muſcles that move the Fingers and Toes, and with them in the boyling of dead Carkaſſes, and the Purgation and Denudation of the Bones are utterly loſt, unleſs great care be taken to preſerve them.

In Infants they are Griſtly, afterwards by increaſe of years they grow bony, and being overſpread with a Griſtle reaches to the ſeat of another Bone.

Bigneſs. I. *Their bigneſs varies, according to the difference of the Bones to which they ſtick.* In the Hands they are bigger then in the Feet; except in the great Toe, to which the biggeſt is faſtened at the head of the *Metapedion* Bone, which lyes under the Tendon of the Muſcle moving the firſt Bone of the great Toe, having another much leſs joyned to it. But this biggeſt of all, which reſembles the half part of a Pea, both for ſhape and bigneſs, is by the *Arabians* called *Albadaran*. Of which the *Jews* fain many Fables, as they do of the Bone *Luz*.

III. *The*

Number. III. *The Number of these Bones is not always the same*; for sometimes twelve are found in each Hand and Foot; sometimes fewer, sometimes more. Neither is it probable that their Number is alike in all People; but rather that they are not all to be found, being so very small, in all Carkases.

To these are to be added the *Sesamoides* lying hid in the *Ham*; of which this is peculiarly to be observed, that they do not grow to the Tendons of the Muscles as the other *Sesamoides* do, but to the Heads of the two first Muscles moving the Feet.

The Number of all the Bones. IV. Now for the satisfaction of the curious, as to the number of all the Bones as they are found in People of ripe Years, they are reckon'd to be Two Hundred Fifty Six.

Seven of the Skull; two Sieve-like Bones; eight of the Ears; eleven of the upper Jaw; thirty two Teeth; in the whole Spine, twenty eight; Twenty four Ribs; Three of the *Sternon*; Two Clavicles; two *Omoplates*; Three *Hyoides* Bones; Two Nameless Bones; Six of the Shoulder and Elbow; Twenty four of the Hands; Eight of the Thigh and Leg; Four little Bones in each Ham; Fifty two of the Feet, and four great *Sesamoides* in each great Toe.

To which if you add the prefixed Number of the lesser *Sesamoides* twenty four in the Hands and as many in the Feet; as also the little Bone in each Hand, which is found at the connexion of the Bone of the Wrist, with the Bone of the *Metacarp*; and the little Bone in each Foot, at the side of the Cube-form'd Bone; as also the two Spungy Bones of the Nostrils, the Number of all the Bones will amount to Three Hundred and Ten. For I omit the subdivisions of the Bones, which are rarely to be found in People of ripe years.

CHAP.

CHAP. XXII.

Of the difference of the Bones of Men and Women.

THE Bones of both Sexes agree in most particulars; in some few things they differ.

The general difference. I. Generally the Bones of Women are less then those of Men, as well in their weight and thickness, as in their length, breadth, solidity and hardness.

In the head. II. In the head the Sagittal Suture more frequently extends to the top of the Nose in Women then in Men.

The *Larynx* is lesser in them, and the *Thyroides* Gristle Protuberates less.

In the Breast. III. The fore-part of the *Thorax* in Women is somewhat flat, not raised as in Men; for the more convenient seat of the Breasts.

In Women that have large Breasts, the *Thorax* is often more narrow, and for the most part accuminated by reason of the weight and bulk of the Breasts.

Womens Ribs are less broad, less hard, and less strong then in Men.

The Clavicles in Women are less Arched then in Men for the Beauty of the Neck and Breast.

The *Sternon* Bone at the lower Part is also broader then in Men, and the lower Bone which is somewhat split, together with the Sword resembling Gristle fastened to it, forms a large hole for the egress of the outer Mammary Veins

VI. The *Os Sacrum* in Women is more bow'd to the Exterior Parts, and shorter, but broader then in Men.

The Huckle-bone is more moveable, and more loosly connexed, and sometimes bowed more backwards.

The *Ileon* Bones are for the most Part larger, and more hollowed without-side, for the Womb big with the Birth to rest upon; and this largness of these Bones is the reason of the largness of the Womans Buttocks.

Both Oval holes in the Share-bone are narrower, and a Part of the Share-bone near the *Simphyſis* is broader.

The Spine of the Share-bone near the *Simphyſis* with the other of the ſame kind is more produc'd in Women, and bends outward.

The Tuberoſities of the *Iſchion* ſtand at a farther diſtance one from another. The Commiſſure of the Share-bone in Women, is filled with a Griſtle three times thicker and ſofter; and it is alſo made with a ſhorter Line, to the end that the delivery approaching, the intervening Griſtle being ſoftened and looſened, the Share-bones may the more eaſily open.

In the Joynts the Structure of the Bones is alike in both Sexes.

Nevertheleſs theſe differences are not always to be found, nor in all People. For ſometimes effeminate or ill-ſhap'd Men have many Bones like thoſe in Women; and the Bones of a ſtrong Virago differ very little from thoſe of Men. However this rarely happening does not overturn the general Rule.

CHAP. XXIII.

Of the Conſtitution of the Bones in Infants.

The Conſtitution of the Bones of the Head.

I. IN Infants all the Bones of the Skull are very thin and ſoft, ſo that a ſlight Compreſſure will make them give way, nor are the two Tables with the Middlemoſt *Diploïs*, to be diſcerned in them till after the firſt year.

The Saw-toothed Sutures are not ſeen in them, but appear like looſe Harmonies.

In the Top of the Head at the meeting of the Sagittal and Coronel Suture, there is a gaping, which inſtead of Bones is cloſed with a thick and tough Membrane, which is afterwards dry'd up to a bony hardneſs. In this Part, the Puſation of the Brain is both ſeen and felt. *vid. cap.* 6.

The Bones of the Fore-head are thicker then the reſt; and are two, provided with no Cavities.

The Bone of the hinder Part of the Head is extreamly thin, contrary to what it is in Perſons grown up, and may be ſeparated into many Parts; *vid. cap.* 4. and 6.

In the Temple-bone, a lineal Harmony diſcriminates the Scaly from the Rocky Part, being drawn beyond the hole of the Ear, between the *Maſtoides Apophyſis*.

The Auditory Paſſage, is Griſtly till the ſixth Month; afterwards grows bony; however it's fore-circle cannot be divided from the reſt of the Bone, till the ſeventh Year. But at the Baſis it is found Gaping, and as it were, like a Window, till thirteen years of Age and more.

The Cavity of the Ears are very narrow, and the wonderful Structure of the Labyrinth hardly appears.

The inner Circle of the *Tympanum*, to which the Membrane is affixed is eaſily divided from the reſt of the Bone.

The *Sphoenoides* is manifeſtly diſtinguiſhed into three or four Bones; *vid. cap.* 7.

The *Ethmoides* is very ſlender, and almoſt griſtly; and hardly any perforated holes are to be diſcerned therein.

The *Cocks-comb* in Infants is not conſpicuous.

The upper Fence of the Noſtrils is very ſoft, and hardens long after the reſt of the Parts.

A certain Suture runs through the Orbit of the Eye, and remains diſcernable therein to the tenth Year.

In the beginning of the Palate a Tranſverſe Line appears, which is extended from one Dog-tooth to the other, and comprehends the four Cutting Teeth.

No Teeth appear in the Mouth, *vid. cap.* 10.

The lower Jaw conſiſts of two Bones, joyned together in the Chin by Harmony.

The *Hyoides* Bones are griſtly.

All the Vertebres of the Spine, except the firſt and ſecond of the Neck, conſiſt of three Parts. *vid. cap.* 11. and their tranſverſe Proceſſes, together with the Poſtic, are griſtly, and ſo little that they can hardly be ſeen; the aſcending and deſcending very ſmall and griſtly, but more conſpicuous.

The

The *Os Sacrum* consists of five Bones, as *Cap.* 12. and each of those divisible into three Parts, as are all the Spines of the Vertebres.

These five Bones are separated one from the other by an intervening Gristle, and the Postic spiny Sharpness is altogether gristly.

The Ribs at the Articulations of the Vertebres are gristly and quickly harden'd.

The *Sternon-bone*, except the uppermost Particle, is altogether gristly and continuous, and seems undivided; first, the upper Parts become bony, then the rest by degrees, and then it consists of eight Parts, which in a short time are reduced to seven, the last two uniting into one Bone. Afterwards they become fewer, and six only appear till the seventh year, after which Age, they unite by degrees, till only three or four remain.

In the Omoplate, the Epiphyses and Apophyses are gristly. The Neck also with the glenoides Gristle is of the same Nature. The *Coracoides* Eminency is an *Epiphysis*. The *Acromium* is first an *Epiphysis*, consisting of much Gristle, which after three or four years, degenerates into an *Apophysis*.

Of the Arms and Hands.

II. ***The upper and lower Appendixes of the Shoulder are gristly, and afterwards grow bony.***

The upper Part of the Elbow is an *Epiphysis*, which after one year hardens, and is united to the Bone.

The Bones of the Wrist seem to consist of an undivided Gristle. These at first being spungy, and divided one from another, then harden by degrees, and grow firm.

The Extremities of the Bones of the *Metacarp* and Fingers are gristly, and within a year grow bony.

Of the Legs and Feet.

III. ***All the Nameless Bones, till the seventh year, consist of three Bones,*** **v. c. 16.**

The little Pan of the Hip-bone is gristly, and so remains for several months, but then hardens into Bone.

The upper and lower Processes of the Thigh-bone for some time remain gristly.

The Knee-pan continues a long time gristly.

The upper and lower Appendixes of the Shin-bone and Button are gristly, and when they are hardned, cannot be parted till the tenth year.

The Bones of the *Tarsus* remain gristly for some months, except the Bone of the Heel, which is bony within and gristly without.

The Sesamoids remain gristly till years of Maturity. Whence it appears, that the Bones of Infants differ very much in Number from the Bones of grown People.

But what has been said is chiefly to be understood of Infants newly born: For as for the Condition of the Bones in the Womb, their Generation, and the Progress of their Formation Month by Month, *&c.* See *Theodore Keckringius, Lib. de Osteogenia fœtuum*, accurately describ'd with Cuts.

CHAP. XXIV.

Of the Nails.

THough the Bones are not Nails, yet by reason of their Remarkable hardness, and consequently Similitude to the softer Bones or harder Gristles, we shall add them to this Discourse of the Bones.

The Definition.

I. ***The Nails are horny Parts fix'd at the Extremities of the Fingers and Toes.***

Their Names.

II. By the Greeks they are called ὄνυχες; the Root of the Nail εἴζονυχία; the upper white Part, or little whitish Half-moon ἀνατολή; the Pellicle growing over the Root ἀρχεμώνη.

Parts.

III. *Julius Pollux* divides the Nails into the Parts under the Nail, the upper Parts, the Parts on both sides, the Parts next to them, the White next the Roots of the Nails; the Clouds in the Nails, and the Ends within the Fingers.

Substance.

IV. ***Their Substance is indifferent hard, and without any Sense of Feeling***; in the middle between a Bone and a Gristle, which is the reason they are flexible.

Colour. V. *Their Colour is transparent,* or else, according to the Disposition of the Flesh that lies underneath, sometimes ruddy, sometimes pale, sometimes livid, or of any other Colour. From *Hippocrates* and several other Physitians they take their Indications of Sickness and Health.

Connexion. VI. *They grow very fast to the Flesh that lies underneath and about the Roots, are bound with a Strong Ligament,* to the end they may stick the firmer, and the Skin embraces them in their full Compass, in the same manner as the Gums environ the Teeth.

Use. VII. There is one at the Extremity of each Finger and Toe, for the Security of the Sensible Parts that lye under them; for that Nerves and Tendons are carried to their very utmost Extremities, and are dilated under the Nails, and contribute a most acute Sense to those Places; so that unless those extream Parts were guarded by the Nails, the general Uses to which they are put, would cause a continual Extremity of Pain, and render the ends of the Fingers altogether useless, and this is their primary Office, their secondary use is for scratching, and several other Employments.

Whether they be Parts of the Body? VIII. *Vulgarly they are said to be produced from the thicker and more viscous Excrements of the third Concoction, and are numbred among the Parts of the Body:* Which Opinion *Galen* seems to favour, who says that no Vessels are bequeath'd to the Nails, but that they take their Encrease from the Roots like the Hair; though in another place he asserts, that there is a Vein, an Artery and a Nerve extended to the Roots of the Nails, from whence they receive Life and Nourishment.

But to resolve this Doubt in short, three things are to be considered. First, that the Spots in the Nails are never obliterated, until the Part in which they appear growing beyond the Flesh, come to be par'd off with the rest of the Nail.

Secondly, that though the Colour of the Nails seems to be changed in several Distempers of the Body, yet that is no real Change of the Colour in their Substance, but only of the Humors that lye under; for that the Nails are transparent, so that the Colour of the Blood or any other Humors underneath appears through them. And therefore in a Syncope, or the beginning of a Quartan Ague, by reason of the little Blood that comes to those Parts, they look pale. In Plethories, by reason of the great quantity of Blood, they look red; and in Cacochymies they look of an ill Colour.

Thirdly, the Nails live and grow after Death; which as *Aristotle* asserts, so is it not to be questioned upon common Experience.

Which Considerations being premised, it will sufficiently appear.

1. That they do not live a Life common with the Animate Parts of the same Body; but a peculiar vigitable Life.

2. That they are not nourished by the Blood alone, but by other Nourishments, which remain after the Decease of the Body, after the Blood has been long wasted and putrified, therefore it is not probable that any Arteries or Veins enter their Substance, though perhaps they may extend to their Roots, to be distributed to the Parts underneath.

3. Thirdly, that they do not grow in their whole Substance but only by Apposition of Parts to the Root, which the Parts before by degrees thrust forward to the Root.

From whence we must conclude, that they are to be call'd Parts of the Body, as they make toward the Perfection of the Whole, for no man can be perfect without his Nails, but not as they enjoy a common Life with the rest of the Parts, for that we find they live a peculiar Life after the Death of all the rest of the Parts, *Vid. l.* 3. *c.* 2.

The manner of their growth. IX. *But then there is another question, whether they grow in length, breadth and depth;* which *Spigelius* denies. But *Bauhinus* and *Hoffman* will have them to grow rather in length, than in breadth and depth. *Lindan* admits them all the Dimensions of Growth, and confirms it by that of a Woman at *Enchysen*, so careless of her self, that she let her Nails grow to that prodigious length, that she could not go. A Chyrurgion was sent for to pair them, *and my Father,* says he, *carried away the Parings along with him. The Paring of the Thumb was two Thumbs long, a Fingers breadth thick, solid about the Roots, and thence compacted of several Slates. The pairing of the middle Finger was as long*

long as the first, but not so thick, yet very thick. None shorter than a Thumbs length; that of the little Toe, thicker than usually the thickest Nail of the great Toe. What grew in breadth, was seen to be crooked within. Platerus tells a Story not unlike this, of a Girl whose Finger Nails were a Fingers breadth in thickness, and jetted forth extreamly, so that they rather look'd like Hoofs than Nails. So I knew a Man, the Nail of whose second Toe of his Right Foot was grown to the thickness of a Finger, solid about the Root, but toward the Fore-part consisting of so many Slates, like so many Hoofs, which very much hindred his Going, though the same Deformity were not in the rest of his Nails.

ANATOMY

Concerning the

GRISTLES and LIGAMENTS.

CHAP. I.

Of the Cartilages, &c.

A

THE

THE TENTH BOOK OF ANATOMY.

Concerning the GRISTLES and LIGAMENTS.

CHAP. I.

Of the Griſtles.

Definition. I. A Griſtle is a ſimilar cold Part, moderately dry and void of Senſe, generated out of the glutinous and earthy Part of the Seed, for the ſtrengthening of many ſoft Parts, and fruſtrate the violent Attacks of outward Accidents.

Subſtance. II. To this end their Subſtance is ſmooth, polite and flexible, harder than a Ligament, ſofter than a Bone; which when the earthy Particles exceed the glutinous, acquire a greater hardneſs, and eaſily become bony. But when the glutinous exceed the earthy Particles, ſometimes become bony, as in the Joynts of the Arms and Thighs, *&c.* But the Particles are equally mixed, if any remarkable dryneſs happen by Age or dyet, ſometimes they become bony, beyond the common Cuſtom, and as in the Buckler-like Griſtle, and that of the rough Artery. And therefore *Cardan* cites an Example of a Thief that could not be hang'd at *Millan*, becauſe his rough Artery was become bony.

The Griſtles have three remarkable Cavities like the Bones; neither are they nouriſhed with Marrow, but their Nouriſhment eaſily penetrates their ſofter Subſtance, and broader Pores.

They differ in Bigneſs, Shape Situation, Connexion, Uſe and Hardneſs of Subſtance, ſome make the Heads of the Bones ſlippery; others conſtitute the Parts, as in the Ear and Noſe; others are ſpread over the principal Parts, as in the Griſtles of the Ribs and Sternon-bone.

Their uſe. III. ***The uſe of the Griſtles is various and ſingular.***

1. To render the Motion of the joynted Parts eaſie, for that in living Creatures they abound with plenty of ſlippery Humors.

2. To joyn ſeveral Bones by *Synchondroſis.*

3. To withſtand the violent Puſhes of ſolid Bodies.

4. To defend the various Parts from External Injuries; ſuch are the Griſtles of the Ribs annexed to the Sternon.

5. To make ſeveral Parts either prominent or hollow, as the Ears, the Noſe and rough Artery.

6. To enlarge the Cavities of the bigger Joynts.

To theſe we may add the peculiar uſe of the *Epiglottis*, which ſerves inſtead of a Cover, and the Griſtles of the Eye-lids, to which they ſerve as Props.

All

All Bones that are Joynted are overspread in the Joynts with a Griſtle, and they are more ſlippery which perform nimble and violent Motions; thoſe more viſcous that perform ſlow and eaſie Motions.

CHAP. II.

Of the Ligaments in General.

Definition. I. A *Ligament, in* Greek σύνδεσμος, *in* Latin, Vinculum, *is a cold Similar Part, dry and firm, but looſe and flexible, appointed for the faſtning together of ſeveral Parts.*

Subſtance. II. *They are ſaid to be generated out of the clammy and tenacious ſort of the Seed,* which is the reaſon their Subſtance is both ſolid and white, between a Membrane and a Griſtle, leaſt they ſhould eaſily burſt; ſofter than a Griſtle, to be more pliant to the Motion of the Muſcles. And as they approach nearer to the Nature of one than the other, , hence a Ligament is ſaid to be either Griſtly or Membranous. Beſides theſe Differences taken from the Subſtance, many more are taken from their Riſe, their Inſertion, their Strength, their Shape and Hardneſs.

Thoſe that bind the Bones are void of Senſe, that they ſhould not make the Life of Man uneaſie by continual Pains through the Motion of the Parts; yet ſome that riſe from the Perioſteums, and are therefore ſomewhat Membranous, are thought to be ſomething ſenſible, as are alſo ſome other Membranous Ligaments, that faſten the Liver, Womb and Bladder to the adjoyning Parts.

Nouriſhment. III. *The Ligaments are nouriſhed with Blood,* not Marrow, as *Columbus* believes, which paſſes to them through the undiſcernable Capillary Arteries.

Figure. IV. *Their Figure is broader and narrower, round, flat, ſhorter or longer, according to the variety of the Parts that are to be bound,* their Situation outward or inward, and the Conveniency of their Uſe.

Their riſes. V. *They riſe from a Bone, a Griſtle, or a Membrane, and are inſerted into the ſame.*

Uſes. VI. *The Ligaments faſten the Parts after a twofold manner*; either for Conveniency of Motion, and to prevent their ſlipping out of their Places; or elſe to keep the Parts fix'd in their Stations, without any Violent Motion.

Their firſt Connexion is common to all Joynts, according to the ſwifter or ſlower Motion of which, ſome are faſtned with ſlenderer and looſer, ſome with thicker and ſtronger Ligaments, and thoſe environ the whole Joynt, and grow either to the Bones that conſtitute the Joynt, or to the Bones of the Cavities and Circumferences of the Heads, or to the Griſtles running between the Joynt. If more Joynts meet together, then they are overſpread with more Griſtles outward.

Beſides that, they environ the whole Joynts, there are alſo peculiar Ligaments that belong to ſome Parts which require a ſtronger Connexion, thick, thin, round and broad, of which, ſome proceed tranſverſe from one Bone to another, others run between the Joynts, as between the Vertebres, and between the Interſtitium of the Thighbone and *Acetable* of the Hip; and theſe are called griſtly Muſcles.

The hinder Connexion, which only keeps the Parts fixed in their places, without any remarkable Motion, is conſpicuous in the Ligaments of the Liver, Bladder and Womb, and the Annulary Ligaments which environ orbicularly, the Tendons of the Muſcles of the Hands and Feet; as alſo in thoſe that faſten the Radius to the Elbow, and the Button to the Shinbone, *&c.*

CHAP. III.

Of the Ligaments of the Head, Jaws, Hyoides-Bone and Tongue.

THE Head being fixed upon the firſt Vertebre, in regard it moves over that and the ſecond Vertebre, requires to be faſtned with very ſtrong Bonds, and here three very ſtrong Ligaments faſten theſe Parts.

The Ligaments of the Head.

I. ***The firſt, which is the biggeſt and broader, orbicularly environs the whole External Joynt, and extends it ſelf to the Internal Membranous Portion of the Vertebre.*** This faſtens to the Head the firſt Vertebre in the hinder Part of the Head, from whoſe Baſis it ariſes, and to the end it may take the better hold, the hinder Part of the Head is rough in that place, and in Children ſunder'd into many Diviſions.

The Second, which faſtens the ſecond Vertebre to the Head, is round and very ſtrong, and growing partly from the External Seat of the Tooth, partly from the top of it, is faſtned to the Bone of the hinder Part of the Head, at the great Hole, and ſo, together with the Tooth, forms an Axle, about which the Head is turned.

The Third, which is of a griſtly Nature, is ſpread over the Tooth it ſelf, tranſverſe, and environs the Cavity which receives the Tooth. It proceeds from the ſide of the firſt Vertebre, and is faſtned to the other ſide of the ſame Vertebre, thereby preventing the Tooth from ſlipping out of its Cavity, which would cauſe a Luxation and Compreſſion of the Spinal Marrow.

Of the upper Jaw.

II. *The Ligaments of the Jaw*, between Sutures and Harmonies, are thin and Membranous, provided for the Inſertion of the Muſcles.

The whole Joynt of the lower Jaw, with the Bone of the Temples, is wrapt about with a common Membranous Ligament.

Of the Os Hyoides and the Tongue.

Various Ligaments belong to the *Hyoides-bone* and the Tongue. Two from the larger Proceſſes of the *Hyoides*, to which the loweſt part of the Tongue is faſtned.

Two adhere to the Horns of the ſaid Bones, and are faſtned to the *Apophyſes* of the *Styloides*, which keep the whole Bone with its Muſcles mixed, for the Tongue to reſt more ſecurely upon it.

One ſtrong Ligament under the Tongue, and proper to it, extends it ſelf to the Fore-teeth; which if it bind the Tongue too hard in the lower Part toward the Teeth, is a hindrance to the Sucking of Infants, and the Speech; and therefore is uſually clipt with a Pair of Sciſſars.

CHAP. IV.

Of the Ligaments of the whole Trunk.

BY reaſon of the various Motions of the Spine, it was neceſſary that the Vertebres ſhould be faſtned with ſtrong Ligaments, which are of three ſorts.

The Ligaments of the Vertebres.

I. ***The Bodies of the Vertebres themſelves, chiefly before and at the ſides, are faſtned with Ligaments reſembling a Half-moon, thick, fibrous and ſtrong;*** which environ the *Vertebres*, and knit them ſtrongly together all the whole length of the Back, ſo that they may the more eaſily endure violent Motions.

II. The Bodies of the Vertebres, where they are joyned, ſtrongly cohere by a griſtly, fibrous and ſlimy Ligament, thick without ſide, and thin toward the middle, anſwerable to the largeneſs of the Vertebres, and reſembling them in Shape, and detaining a Griſtle in the middle between the Vertebres, from whence a Ligament is thought to ariſe.

III. The Proceſſes of the Vertebres, as well tranſverſe as acute, are faſtned by common Membranous Ligaments; which in pointed Proceſſes ariſing

ariſing from a certain middle Channel of the upper Spine, and inſerted in a certain kind of Line of the Spine, underneath, and uniting with the following Spines, in order from one Ligament, drawn all the length of the Species, and ſo continue the Vertebres together, as if they were but one Bone.

Of the Ribs. II. *The Ribs are coupled to the Vertebres by ſtrong and almoſt Griſtly Ligaments*, which riſe from the tranſverſe Ligaments of the Vertebres; but are joyned to the *Sternon* by ſlender Ligaments, the Griſtles going between.

Of the Sternon. III. The Bones of the Sternon are very tough, by means of a Griſtle going between, and being enveloped with a double *Perioſteum*, are moſt firmly bound together.

Of the Os Ilion. IV. The Ilion-bone, beſides that, it adheres moſt obſtinately to the *Os Sacrum*, by means of a tenacious Griſtle interpoſed, is alſo faſtned by a common, broad and ſtrong Ligament.

Of the Os Sacrum. V. The *Os Sacrum* is faſtned to the Ilion-bone with a thick Griſtle, and by a double and round Ligament, which ſpringing from one Part of the *Os Sacrum* with one end, is inſerted into the pointed Proceſs of the Hip, with the other into its hinder Appendix, and ſo not only firmly binds theſe Bones, but alſo ſuſtains the Right Inteſtine, with its Muſcles.

Of the Os Pubis. VI. The Share-Bones are faſtned together, partly by an intervening Griſtle, partly by a double Ligament, of which, the firſt circularly environs them; the other, which is membranous, poſſeſſes the Hole it ſelf, and ſuſtains the Muſcles of that Place.

The other Ligaments, ſee in their proper Places.

CHAP. V.

Of the Ligaments of the Scapular Arm and Hand.

THE Scapula is joyned to the Shoulder-bone and the Clavicle with five Ligaments, which chiefly ſeem to conſiſt of the Tendons of the Muſcles of the Omoplate, environing the Head and Neck of the Shoulder-bone, and ſo united, that they conſtitute one ſtrong orbicular Ligament. Of which,

The *Firſt*, which is broad and membranous, riſing from the Brows of the Neck of the Scapula, environs the whole Joynt, and is inſerted into the foremoſt and inner Region of the Head of the Shoulder.

The *Second*, which is round like a Nerve, but thicker and bigger than the preceding, riſing from the top of the inner Proceſs of the Scapula, is fixed into the interior Parts of the Head of the Shoulder.

The *Third*, which is round and thicker and bigger than the preceding, riſing from the *Coracoides* Proceſs, terminates in the Head of the Shoulder on the outer Part.

The *Fourth*, which proceeds with a large beginning from the ſame Place with the former, is implanted into the hinder and outer Seat of the Head of the Shoulder.

The *Fifth*, which riſes from the inner Seat of the Scapula, and proceeds obliquely upward to the top of the Shoulder.

The Ligaments. I. *The Ligaments of the Elbow are double*, of which, the one is ſtrong and membranous, the other is encompaſſed with all the Muſcles, all the length of the Shoulder, and keeps them fixed in their Seat, to which, the proper Membranes of the Muſcles ſtick very cloſe.

The reſt of the Ligaments bind the Bones together. For the *Ulna* and the Radius are faſtned to the Shoulder by common and ſtrong Membranous Ligaments; to the Wriſt, not only by common, but alſo by two peculiar and

round Ligaments. Of which, the firſt, which is more griſtly, proceeds from the *Styloides* Proceſs, to the fourth Bone of the Wriſt, and joyns the lower Arm-bone, called the *Ulna* to the Wriſt; the other growing from the top of the Radius, receives the Wriſt, and joyns the Radius to the Wriſt, which is yet more ſtrengthened by the nervous Ligament environing the whole Joynt.

The *Ulna-bone* is faſtned to the Radius above and below by a common Ligament; as alſo by another peculiar and ſtrong membranous Ligament, ſeated between the Intervals of the Bones all their full length; which riſing from the ſharp Line of the *Ulna*, is implanted into the Line of the Radius.

Of the Wriſt.

II. ***In the Wriſt there are two Ligaments*** ; of which, one only joyns the Bones together; and both together ſtrengthen the two Tendons that are to be tranſmitted farther.

The firſt riſing from the lower Proceſs of the Radius and Elbow, enfolds the Bones of the Wriſt, and binds them ſtitely together, terminating in the Appendix of the Bone of the Metacarp.

The two others are carried from the Bone of the Wriſt, looking toward the Thumb, reaching to the Little-finger tranſverſly, the one outward, the other inward like a Ring; and therefore by thoſe that take theſe two for one Ligament, called the Annular Ligament, and contain the Tendons of the Muſcles extending and bending the Fingers. *Laurentius* and *Bauhinus* believes the Exterior may be conveniently divided into ſix Ligaments.

Of the Metacarpium.

III. ***The Bones of the Metacarp are joyned to one another, and to the Bones of the Wriſt by common Ligaments.***

The Internodes or Knuckles of the Fingers are faſtned by common Ligaments. But in the Hollow of the Hand the Phalanxes of the Fingers are faſtned to the Bones of the Metacarp with a tranſverſe Ligament. Moreover, every ſingle Finger has a Ligament running out at the full length of the Fingers, and riſing from the Internal Part of the Bones, which reſembles a Channel, and keeps the Tendons bending the Fingers firm in their Places.

To theſe may be added a ſlimy Membrane, which is overcaſt with Tendons, tranſmitted to the Hand and Fingers inſtead of a Ligament.

CHAP. VI.

Of the Ligaments of the Leg and Foot.

The Ligaments of the Thigh.

THE Thigh is faſtned to the Iſchion with two Ligaments. One which is the Exterior, environs the whole Joynt, and is broad, hard, thick and ſtrong. The other, which is more inward, and cannot be ſeen, unleſs the other be cut away, proceeding from the bottom of the *Acetable*, is inſerted ſoon after into the middle Head of the Thigh, and is oblong, round and hard, and hence by ſome called the *Griſly Nerve*.

The Luxation of the Hip.

II. ***Theſe Ligaments, if they be overmuch looſned by the Defluxions of Phlegmatic Humors, cauſe a Luxation of this Joynt,*** which upon returning the Bone into its Place, is cured by drying and corroborating Medicaments, and commodious Swathings. But if they happen to be corroded by any ſharp Defluxion, the Cure is not to be hoped for. Or if the Luxation happen by any outward Violence, then the inner round Ligament is for the moſt part burſt, for that the hardneſs of it will not ſuffer Extenſion, which is the reaſon that ſuch a Luxation is incurable. For though the Bone may be reduced into the Acetable, yet it will ſlip out again for want of the burſt Ligament. And therefore Chyrurgeons are to be careful how they attempt the reducing ſuch a Diſlocation, which will coſt the Patient a vaſt deal of Torment to no purpoſe.

III. *Six*

Of the Tibia. III. *Six Ligaments faſten to the Shin-bone and Button to the Thigh*; Of which,

The *Firſt*, is Membranous and common, which environs the whole Joynt, except the Region of the Knee-pan.

The *Second* ſtrong and Nervous ſeated in the inner Part of the Knee, riſing from the Proceſs of the Leg, is inſerted with two heads into the Head of the Thigh.

The *Third*, which is griſtly and ſtrong riſing out of the higher Part of the Shin-bone, among its Cavities, enters the middle Cavity, which is behind within the heads of the Thigh.

The *Fourth* which is thick and almoſt round, adheres to the outer ſide of the Knee, and binds the Bones of the Thigh, Shin-bone and Button.

The *Fifth*, ſomewhat more ſlender and ſofter then the former, growing to the Inner-ſide, is carry'd obliquely into the Fore-parts of the Thigh.

The *Sixth*, which is ſlender and ſoft, is found in the middle of the Joynt of the Knee, and carry'd from the Shin-bone into the Thigh. However this is not always to be found with the two preceding; and therefore ſome acknowledg only three Ligaments in this place one common, and two interpos'd, and thoſe bloody.

Of the Tibula. The Shin-bone is faſtened to the Button with three Ligaments.

The *Firſt* and *Second* are common Membranous Ligaments; One which at the upper and outer Part enfolds the Connexion of the Bones: the other which proceeding at the lower Part from the Shin-bone, approaches the Button. The *Third* is the peculiar Membranous Ligament, which growing all its length to the Shin-bone, is carry'd to the Button, and expanded through the Interval between the two Bones, and ſo conjoyns the Bones, and alſo diſtinguiſhes the Muſcles of that Place, and to ſome of them gives their Original.

Of the Feet VI. *The Ligaments of the Foot are twofold; ſome that faſten the Tendons from ſlipping out of their places: others which bind the Bones together.*

Thoſe are three; of which,

The *Firſt* is ſeated before at the joynting of the Shin-bone with the foot.

The *Second* proceeds from the Inner *Melleolus* to the Bone of the Heel, and conſtitutes as it were three little Rings for the Tendons to paſs through; becauſe there are three Cavities there.

The *Third*, ſpringing from the outer *Mallelous*, is implanted into the Bone of the Heel, and is ſpread over two Holneſſes.

Beſides theſe already mentioned in the inner Region of the Toes, you meet with tranſverſe Ligaments, as in the Hand, which faſten the Tendons binding the firſt and ſecond Internode of the Toes.

Of the Talus. VI. *Thoſe that faſten the Bones, are either of the* Talus, *or* Pedon, *or* Metapedon *or of the Toes.*

Three Ligaments faſten the *Talus* of which,

The *Firſt*, which wraps about the Bone of the Shin and the *Talus*, is Membranous, whereas the reſt are griſtly.

The *Second*, ſpringing from the inner Part of the *Talus*, is implanted into the Bone of the Shin looking toward the *Talus*.

The *Third*, faſtens the Exterior of the *Talus* to the Button.

Five Ligaments faſten the *Talus* to the *Pedion*.

The *Firſt* is common, which wraps about the Joynt of the Heel and *Talus*; this is Membranous whereas the reſt are griſtly.

The *Second*, proceeds from the lower Seat of the *Talus* to the Heel.

The *Third* riſing from the Neck of the *Talus*, is implanted in the Navicular Bone.

The *Fourth*, joyns the Bone of the *Teſſara*, with the Neck of the *Talus*.

The *Fifth* couples the Bone of the Heel with the *Teſſara* Bone, and environs the Joynt.

VII. *The*

Of the Pedion.

VII. *The Bones of the* Pedion *are fastened one to another, and to the neighbouring Bones, with very hard and gristly Ligaments*; to which at the lower Part for the more strenuous Coroboration, is added a strong peculiar Ligament, which binds the middle Parts of the Bones together.

Of the Metapedion *of the* Toes.

The Ligaments of the *Metapedion* and Toes differ little or nothing, either in Structure, Insertion, and Form from the Ligaments of the Hand. Under the Sole of the Foot, the Skin and Fat being taken away, occurs a broad and strong Ligament, which fastens the the Bones of the First *Phalanx*, and comprehends its *Sesamoide* Bones.

THE END.

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V.

A TREATISE OF THE SMALL-POX AND MEASLES.

CHAP. I.

Of the Small Pox and Measles in General.

FOrmerly the *Arabians* and most famous Physitians annexed to their Discourses of the Pestilence and other Contagious and Epidemic Diseases their Treatises of the Small Pox and Measles; we therefore led by their Authority are of opinion that the Small Pox and Measles are Contagious Diseases.

But in this first Chapter before we speak in Particular of these Diseases, it will be necessary by way of Preface to say something in General of the Names, Original, Nature, Subjects and differences of both Diseases.

As to the Names, we meet with some variety among the Writers of Physic. Among the *Greeks*, the words ἐκθύμαλα and ἐξανθήμαλα were most in use (both which the *Latins* comprehend under the single Name of *Papulæ*; and *Alzaravius* in his own Language calls *Algigram*, and *Alasmom*, and *Mercurialis*, *Efflorescencies*) by which they did not always understand two distinct Diseases, but frequently one and the same. Others make two sorts of ἐξανθήμαλα; The one when the Wheals break through the Skin and rise up in Powks; the other, when the Colour of the Skin is only chang'd. The First of these some call more particularly ἐκθύμαλα, and the *Latins* have called *Variolæ*, as it were little Warts; to which some have added the other Name of *Papulæ*, small Teats or Pushes. The latter are by the *Greeks* called ἐξανθήμαλα, and by the *Latins* *Exanthemata* and *Morbilli*. We are to take notice however by the way, that *Exanthemata* are properly those little Purple spots, called the *Tokens*, which appear upon the Skin of the Persons infected with the Plague (of which we have spoken in our Treatise of the Plague) but afterwards this word was by many Physitians given to the *Morbilli* Measles. However it were, at this day there is no question to be made of the Signification or Ambiguity of the

Words, seeing that by ἐκθύματα and *Variolæ*, all Physitians generally understand those Wheals or Powks that break forth through the Skin and Suppurate, being conspicuous over all the the Body: and by *Exanthemata* or *Morbilli*, those little red Spots which do somewhat corrode the Skin, and are sometimes full of small Pimples like Millet Seed.

As to the Original of these Diseases there is great variety of Opinions among the Physitians. For some will have them to have been as ancient as the Original of the World; and that they were well known to *Hippocrates*, *Galen* and others of the Antient *Greeks*. But *Mercurialis*, *Liddelius* and others affirm, that they were altogether unknown to the *Greeks* in former times, and were first discovered in the Age of the *Arabians*, and that therefore their first description was set forth by them; whereas the *Greeks* have left behind them nothing in particular written about those Distempers. But the latter Opinion seems to be less probable, seeing that the Descriptions of the *Greek Ecthymata*, and *Exanthemata* differ very little from our *Variolæ* or Pox, as appears out of *Hippocrates*, *lib.* 3. *Epid.* in his Cure of *Silenus*. And because the *Arabians* also do not describe those Diseases, as new ones, which they would have done, had they either known or thought to be unknown to the *Greeks*. Add to this that though the *Greeks* in their Writings do not treat particularly of these Diseases, as the *Arabians* do, but intermix them in the Description of those Epidemic Diseases, which are understood by the manner of their *Crisis*, yet it cannot thence be concluded, that they were to them unknown; in regard the contrary to that appears from hence, that they write many things common among us, as well in reference the Nature, as to the Cure of those Diseases.

These Diseases are not one and the same, but of a distinct Nature: For they are the Diseases of an ill Temper, which is known by a Preternatural heat and Fever; as also Diseases of a deprav'd Conformation, as being accompanied with Tumors, and a dividing of the *Continuum*.

They are referred to acute Malignant, Contagious, Epidemic and Pestilent Fevers (though not so deadly as the Pestilence) because they are determined for the most part within fourteen days, or at least never surpass the fortieth. They participate of Malignity, are propagated by Contagion, like the Pestilence, and are frequently Rise and Epidemical.

They only wage War with Mankind, in regard it has not been observed by any Physician, that ever any other Creatures are afflicted with these Distempers.

Moreover they are not only common to Men, but to all Mankind; insomuch, that there are very few Men or Women living, that hath them not at one time or other. Hence it was the saying of *Avenzoar*, that it was a Miracle, if any living Mortal escaped these Diseases, and that it was rather to be ascribed to the goodness of God, then to any other cause. Which *Thomas Willis* also seems to intimate, *lib. de Feb. cap.* 16. where he says, *It is no more then what every man is to expect once to be afflicted with the Small Pox or Measles: if by chance any one live free from them all his Life, or if another have them more then once, they are rare and unusual Events of Nature, that no way contradict common Observation. For it is certain that all Mankind and only Mankind is Subject to the small Pocks and Measles, and if they scape them once, they never have them again.*

The Parts which are affected in these Distempers, is either the whole Body in respect of the Fever, or the External Parts in respect of the Wheals and Spots conspicuous in it: or sometimes the Internal Parts, as the Stomac, Guts, Lungs, Liver and Kidneys; for that those Parts are many times full of the Pox, is frequently seen by the Dissections of Bodies cary'd of by that Distemper.

But these Diseases though they share of the same Malignity yet they differ in these things. 1. That in regard there is a double Excrement of the Blood infected with that Malignity, of which the one is thick, the other thin; the Pocks proceeds from the thicker Excrement, and from the thinner the Measles. 2. That in these by reason of the Diversity of the Matter, there rises up Wheals which are full of Matter; in the other only Spots appear, with a small elevation of the Skin, but without any Mattery Substance. 3. That the first after the Patient is cured, leaves Pits and Scars behind them; the other cause no Deformity.

But because that Spots also break forth in a Pestilential Fever, by which a Physitian may be lead into an Error; we are to observe the difference between

tween thoſe Spots, and the other which break for at the beginning of the Small Pox and Meaſles. 1. That the Spots which firſt appear at the beginning of the Small Pox and Meaſles, are of a florid red Color, and very ſmall, but afterwards dilate, and chiefly appear in the Face and Hands. But the Spots in Peſtilent Fevers are of a more dark Red, oft-times inclining to a Purple, and at the beginning ſomewhat broader, but exactly round, and never appear upon the Face and Hands, but upon the Breaſt and Back. 2. That the Spots in the Small Pox and Meaſles, appear by way of Criſis much about the third or fourth day after the ſeizing of the Fever, and with eaſe to the Patient; whereas the Spots in Peſtilential Fevers, that appear about the ſeventh day, are Symtomatical for the moſt Part, and render the Patient worſe. 3. That the Fever-ſpots, appear firſt like the Bitings of Fleas, but the Spots of the Small Poxs and Meaſles have not the leaſt reſemblance to Flea-bites.

CHAP. II.

Of the Small Pox in Specie.

THE Small Pox are little Wheals full of Matter, breaking forth in the upper Part of the Skin, and conſpicuous (ſeldom ſeizing the inner Parts) accompany'd with a continual Fever, and proceeding from a Peculiar Malignant, Fermentaceous Effervescency of Humors.

They are moſt common to Children; Young men have them not ſo often; and Old men are ſeldom troubled with them.

They ſubſiſt for the moſt Part in the Skin only; and break forth upon the Jaws and Noſtrils, Nature thruſting forth the Malignant Humor from the Center to the Periphery.

In which Operation, if ſhe be hindered or heſitate either by reaſon of her own weakneſs, either through the abundance of the Morbific Matter, or the inſufficient or two ſlow Progreſs of the Specific Fermentation; then not only the Gullet, Stomac, Liver, Lungs, Spleen, Womb, and other internal Bowels are beſet with filthy little Ulcers like the Skin, as we have ſeen in ſeveral dead Bodies after Diſſection, and appears by the Writings and Teſtimonies of *Paræus*, *Fernelius*, and many others.

In the mean time, as to the Skin, we are to take Notice by the way, that although the Wheals are diſpeirs'd up and down in ſeveral Parts of it, yet they do not break forth in all places equal in quantity: for that many times they are more abounding and bigger in the Face, Hands and Feet then in other Parts. The Reaſon of which effect *Lazarus Riverius* aſcribes very plauſibly to the Liver, by whoſe more fiery temper occaſioned by this maligant ebullition, he believes the corrupted and putrid Humors are driven with greater violence to theſe Parts, which he calls the Emunctories of the Liver, than to any other Parts. In the ſame manner as they who have a hot Liver, are us'd to be troubled with red and pimpled Faces; and feel a glowing heat in the Soles of their Feet, and the Palms of their Hands. *Mercurialis* brings other Reaſons for this Effect, but much farther fetch'd. *lib. de Morb. puer.* But the foreſaid Reaſon of *Riverius* ſeems to be very *probable*. Nevertheleſs we are to underſtand, that ſometimes it may happen, that the Pox may be thought to come out in greater abundance in thoſe Parts then in others by miſtake, as not being really ſo, but becauſe in thoſe Parts they are continually in view, and more troubleſome then in other Parts.

No Age can be aſſured to ſcape them, but Children are more frequently troubled with them then People of riper Years. Becauſe her weaker Conſtitutions are leſs able to reſiſt the Specific malignant Matter, and ſeems more apt to that peculiar Ebullition which happens in that Diſeaſe. Old Age challenges a greater immunity from them, then other Ages. Moreover thoſe Bodies are more eaſily infected which have any Analogy with the Bodies which are infected: and therefore Kindred more eaſily infect one another, which we have already obſerved in our Book *de Peſte*.

They are very rife all Seaſons of the Year, but more eſpecially in Spring and Autumn, chiefly if the preceding Winter was warm and moiſt, or the Summer rainy, and the Wind Southerly, attended with plenty of early Fruit.

Sometimes the Diſeaſe diſpeirſes it ſelf, ſometimes it is Epidemic, and ſometimes it ceaſes for a time: But when it is Epidemical, then it happens to be accompanied with other Diſtempers,

Diſtempers, in ſuch as never had the Small Pox before.

They ariſe from the thicker or more viſcous Matter, to which that Malignity adheres, with the Blood fermenting after a Specific Manner, and hence they riſe up into large, mattery Puſles.

Thomas Willis believes that in this Fermentation, ſome Portions of the Blood, are coagulated with the Poyſon, and ſo expelled forth together with it. But this does not ſeem ſo very probable, for though they are corrupted, yet they are not coagulated; ſeeing that portions ſo coagulated, would not ſo eaſily be expelled forth, by reaſon of their extraordinary thickneſs. But this Ebullition is performed after the ſame manner as in Beer that works; wherein there is no coagulation of the Humor; but many ſpirituous Particles being ſtrongly agitated in the Ale by the Fermentaceous Efferveſcency, and involv'd and intermix'd with more viſcous Particles tend upward and ſwim upon the top of the Ale, or elſe burſt forth in froth out of the Veſſel, but are not coagulated; for they are very ſubtle and ſpirituous; as appears not only by their ſtrong Savor, but alſo by this, that out of that ſame ſtrong flower of Ale being diſtilled, are drawn Spirits almoſt as ſtrong as the Spirits of Wine.

A Fever alwaies accompanies the Small Pox, ſometimes gentle, ſometimes higher, ſometimes more remiſs, and that Putrid alſo, as appears by the critical Evacuation by Wheals, which could never be done without a putrid Ebullition. For where corrupt and putrid Humors are ſeparated from the good, there of neceſſity muſt be either ſome Putrefaction, or putrid Efferveſcency: Some there are who write that the Small Pox may come without a Fever, but it is not true. And their miſtake proceeds from hence, becauſe in Infants and little Children, that Fever is ſo gentle before the Pox come out, that it hardly does them any obſervable Prejudice. For if they appear a little more froward then ordinary, or ſleepy, or refuſe their meat, or are leſs chearful then they uſe to be, the Nurſes readily aſcribe that to their Breeding their Teeth, or to the Worms; ſo that when the Small Pox comes out, they are apt to ſay, they came out without any Fever attending them: whereas that ſmall Fever was not ſufficiently taken notice of by themſelves.

Which ſort of Fever can be referred to no ſort of Fever more truly then to that purtrid continual Fever, called *Synoche*. For during that ſort of Fever there is a putrid Ebullition of the Blood in the Veſſels with an equal heat through the whole courſe of the Diſeaſe, and at length a Critical Expulſion of the Vitious Humors.

There are different ſorts of the Small Pox, of which few Phyſitians have taken notice. For ſome are bigger and more full of Matter, and come out thick, which the *Dutch* call Καλὴ ἕξοχὴν, *de Pocken*. Others Leſs, which the ſame *Dutch* call *de Steen Pocken*. And theſe are certain ſmall Wheals without much matter, that come out in the Skin ſcatteringly, and in no extraordinary quantity, without any grievous or violent Symptoms. The others are clear and large, tranſparent like Water or Chryſtal, and containing a certain Watry kind of Liquor, which the *Dutch* call *Wint-Pocken*, and ſome *Water-Pocken*. Beſides theſe there are other differences of the Pox, as they are either great or ſmall, thick or few, deep or ſuperficial, contiguous or disjoyn'd, white or ruddy, livid, violet or other colored, ſoft or hard, high or low, quick or ſlowly coming forth, External or Internal.

CHAP. III.

Of the Cauſes of the Small Pox.

THE Cauſes of the Small Pox are External or Internal. Concerning which there are various and great Contentions among the moſt Eminent Phyſitians, ſo much the more vainly eager, becauſe of little or no uſe; in regard that whatſoever be the cauſe of the Diſtempers, the cure is ſtill the ſame.

Avicen and moſt of the *Arabians*, the firſt moſt accurate Deſcribers of theſe Diſeaſes, refer the material Cauſe to the Impurity of the Mothers Blood, ſtagnant in the Woman with Child,

Child, and with which the Birth was nouriſhed in the Womb. Which Corruption, they write, lyes dormant ſo long in the Body, till by vertue of ſome ſpecific efficient Cauſe, it be provoked to a fermentaceous Effervescency, and being powred forth into the Maſs of the Blood, it ſets it all in a boiling Condition, and by that means ſeparates that Defilment, adhering from the Birth to ſome minute Particles of the Body, and being ſo ſeparated, puſhes it forward, together with the Particles of the Blood ſo defiled by it, to the Extream Parts of the Body, and there raiſes up thoſe Wheals, as in new Wine the Heterogeneal Parts are ſeparated from the Homogeneal Parts of the Wine by Fermentaceous Ebullition. *Avenzoar* ſeems to differ ſomewhat from *Avicen*; for obſerving that the Birth in the Womb, without hazard of Life, can hardly be nouriſhed by the impure menſtruous Blood reſtagnant therein; but with ſome other Blood good of it ſelf, only by reaſon of its Fellowſhip with the menſtruous Blood, defiled by its Superior Corruption; and farther, that Men in the Womb muſt be nouriſhed either with ſome ſuch menſtruous Blood, or ſome other impure Blood, and for that reaſon contracted that Impurity from the firſt Nutrition of the Parts. Hence it was that the *Arabians* believed, that all Men were ſubject to the Small-Pox, in regard that Impurity was again to be ſeparated from the Parts. So that if that Specific Fermentaceous Effervescency be ſtrongly and efficiently performed at the firſt coming of the Small-Pox, then that Impurity becomes totally evacuated; and then the Perſon to whom that Diſeaſe happens, lives free from that Diſtemper all the reſt of his Life (as when Butter is once by a ſtrong Churming ſeparated from Milk, turning ſowr, no Churming, how violent ſoever, can ſeparate any more Butter from it.) But if that Effervescency be not violent enough, that Impurity happens not to be totally expelled, and ſo the ſame Perſon, when the Reliques of that Defilement ferment again, upon ſome other Cauſe, may happen to have the ſame Diſtemper a ſecond and third time, but rarely a fourth.

Duncanus Liddelius ſtoutly defends the Opinion of the *Arabians*; which is alſo followed by *Fracaſtorius*, *Amatus*, *Foreſtus* and ſeveral other Phyſitians, and among the reſt, by *Thomas Willis*, *Lib. de Feb. c.* 15. Where, among other Reaſons, for greater Confirmation, he adds theſe Words.

In the Womb of Woman, ſays he, *as in moſt other Creatures, there is generated a certain Ferment, which being communicated to the Maſs of Blood, gives it Vigor and Spirit, and cauſes it to ſwell at certain Periods of Time, and procures an Expulſion of the Superfluous Blood. But at the time of Conception, when the Flowers ceaſe to flow, the chiefeſt Part of this Ferment is expended upon the Birth, and the Particles of it heterogeneous from ſome of the reſt, as it were ſomewhat of foreign Subſtance, are confuſed with the Maſs of the Blood and Humors, where they lye dormant a long time. Afterwards, being ſtirred and provoked by ſome evident Cauſe, they ferment with the Blood, and make it firſt boyl, and then congeal, from whence various Symptoms of this Diſeaſe ariſe.*

Gentilis rejects this Opinion of the *Arabians*, not believing the Birth to be nouriſhed in the Womb with any Impure Blood; nor that ſo much Impurity could abide for ſo many years in Men grown up, and old People; when they are ſeized with the Small-Pox, after ſo many Purgations by Sweat, Fevers, Itches, and other intervening Diſeaſes, beſides the Cure of the Great Pox; nor can he think but that Women muſt be cleared of thoſe Impurities in ſo long a time by their monthly Evacuations.

Mercurialis complies with *Gentilis*, who alſo aſſerts, that the Small Pox is a Hereditary Diſeaſe, and conſequently, that there is hardly any Man who can eſcape them, becauſe all Men are born of Parents vitiated by this Diſtemper; and he endeavours to confirm this Opinion of his by ſeveral ſinewy Reaſons, which however *Daniel Sennnertus* overthrows by others much the ſtronger.

Fernelius obſerving ſomething occult in the Productions of the Small Pox, beſides the various Reaſons propounded by *Gentilis* and others, affirms, that they are produced by ſome Celeſtial and hidden Cauſes, which when Infants and Children, are leſs able to withſtand than People grown up: Hence he ſays it happens that the one are much more Subject to this Diſeaſe than the other. But this Opinion of *Fernelius*, is notably refuted by *Mercurialis*, *Lib. de Morb. Puer.*

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Sennertus grants the Small Pox to riſe and be thruſt forth by ſome certain and determined putrid Ebullition of the Humors, but he will have this Ebullition to ariſe from three Cauſes; from the Malignant Air, from the Mothers Blood, and vitious Nouriſhment; and labours in a large Explanation of his, this his own, and the Opinion, of the *Arabians*, and *Fernelius*.

But to ſpeak the truth, none of theſe Opinions pleaſe me. Not that of the *Arabians*, becauſe beſides the Reaſons alledged by *Gentilis*, there is this one more. For that ſeeing that Defilement contracted from the Mothers Blood, is aſſerted to be common to all Men, there would be no Man excuſed from this Diſeaſe; which is contrary to Experience, when ſeveral that have liv'd to an extream old Age, never had the Small-Pox in their Lives, as we have known ſeveral in our own Family. Beſides, if the Impurity of the Menſtruous Blood communicated to the Birth, were the Cauſe of the Small-Pox, why are not thoſe Women themſelves ſubject to it, whoſe Flowers ſtop beyond the Courſe of Nature; eſpecially they who never had their Courſes in all their Lives, yet for all that were fruitful and had ſeveral Children; of which Women, there are ſeveral Examples to be found in *Trincavellius*, *Guainerius*, *Bertinus*, *Marcellus*, *Donatus*, *Joubert*, *Fabricius*, and ſeveral others. Beſides, that private Defilement of every Woman could very hardly infect others by Contagion, or excite a latent Contamination in the Bodies of others to a like Ebullition. If you ſay it may, then give me a Reaſon, why all they that ſit by and attend upon People when the Pox is come forth, and endure their Stenches, are not infected with the Small Pox, though they never had them before? Why has not that Contagion infected me, that am near ſeventy years of Age, who have viſited thouſands in the height of that Diſtemper, endured their Stenches, and handled their Ulcers? Why ſome, upon the Sight at a diſtance of a Perſon that has newly had the Small-Pox, are preſently ſeized by the Diſtemper? It being a thing almoſt incredible, that the Contagion or infecting Contamination flowing from the Sick Patient, ſhould fly at ſuch a diſtance from the Sick to the Sound and Healthy, and ſo infect him, and leave thoſe untouch'd that are always converſant in the Room. Nor do I underſtand that which *Thomas Willis* adds for the Confirmation of his Opinion, that that ſame private Contamination being provoked by ſome Cauſe, ferments with the Blood, and makes it firſt boyl, and then coagulate. For ſince Ebullition always cauſes a greater Attenuation, I do not comprehend how that can cauſe Coagulation. Moreover, if ſuch a ſpontaneous Coagulation were neceſſary after Ebullition, Phyſitians at the beginning of the Diſtemper would ill apply attenuating Diaphoretics, as being a hindrance to that Coagulation, and afterwards they would as erroneouſly preſcribe thickning things, as Lentils, Tragacanth, Figgs, *&c.* which would cauſe too great a Coagulation. Both which are repugnant to Experience, when both the one and the other are ſucceſsfully made uſe of in the Cure of this Diſtemper.

Nor does the Opinion of *Fernelius* pleaſe me; for he, according to his Cuſtom, deduces occult Celeſtial Cauſes in occult Diſeaſes from the Influences of the Stars. But how uncertain and how frivolous all thoſe things are which are deduced from thoſe Influxes, either by Aſtrologers or Phyſitians is apparent from what we have wrote in our Treatiſe *De Peſte*, *Lib.* 1. *Cap.* 8.

Neither can I approve the Opinion of *Sennertus*. For he propoſes three Cauſes of vitious Fermentation, yet by means of that Specific Malignancy which remains in the Small-Pox cannot be explained; and why, by vertue of that vitious Fermentation, procured by thoſe three Cauſes, the Small-Pox ſhould be occaſioned, rather than other malignant, putrid and peſtilent Fevers, or the Itch, St. Anthonies-Fire, Cancers, or ſuch like Diſeaſes.

As to the External and Primary Cauſes of the Small-Pox, by which the Internal Humors are moved, Phyſitians agree the chief of them to be. 1. A peculiar Diſpoſition and depraved Quality of the Air, to which belong the more remarkable Mutations of the Seaſons, as the hot and moiſt Conſtitution of the Spring and Autumn, the Southern Winds, and warm Conſtitution of the Winter. 2. The Perturbation of the Blood and Humors; to which belong immoderate Exerciſe, frequent Bathings, Anger, Fear, and Over-eating, *&c.* 3. Contagion; for Experience tells us, that this Diſeaſe is caught by Contagion: For out of an infected Body continual Steams flow forth, which

which being received by other Bodies, presently like Poyson ferment with the Blood, and excite the latent and homogeneal Seeds of the same Distemper, and dispose them into the Idea of this Disease, and thus those Contaminations flowing forth, are not only communicated by immediate touch, but at a Distance. But by all these Causes, whether good or bad Disposition or Quality of the Air, perturbation of the Humors or Contagion, that Malignant Specific which we observe in the Small-Pox, is not sufficiently made out, nor wherefore it operates more in these, than upon those Subjects, and in these, than at those Seasons. For many times we have observed hot or moist, and hot with moist Seasons and Constitutions of the Air; many times bad Diet, as in Famines and Sieges, which has occasioned a vast Corruption of Humors in the Body; many we find continually indulging their Appetites, which *Willis* numbers among the Primary Causes of this Distemper, and yet no Small-Pox ensued. On the other side, in temperate Seasons, and in cold Winters, they have raged Epidemically among those who have used moderate Diet, and fed upon the best of every thing, and have seized upon Bodies repleniſhed with good Humors, and that many times first of all, before any other Body has been ill to communicate the Contagion, merely upon some Fright, and by the Force of Imagination.

Seeing then that notwithstanding all the Causes propounded by Physitians, the true and Specific Essence of the Malignity which is in the Small-Pox, nor the peculiar and determinate Corruption of the Blood, nor the Cause and Manner of Specific Fermentation can be explained, I think we are rather to conclude, that the next Causes of the Small-Pox, as well the Internal as the External, which move the Internal, are occult (as are also the Causes of the Pestilence it self) and cannot be unfolded by Us. And therefore it is better to acknowledge the Weakness of our Knowledge, then to betray our Ignorance by so many Disputes and various Conjectures, that are grounded upon no Foundation. For who can pretend to give a true and perceptible Reason of so great a Matter? For these are in the Number of those Mysteries, which the Chief Creator is not pleased to let us know exactly.

CHAP. IV.

Of the Diagnostic Signs.

THE Small-Pox are not easily discerned before the Wheals themselves betray the Distemper. But they appearing never so little, then the Sight is easily Judge of the Disease. Seeing therefore it is of great moment in reference to the Cure, to know before the breaking out of the Wheals, whether it be the Small-Pox or no, the Signs of their coming out are first to be inquired into and observed.

The Signs foretelling the Small-Pox to be at hand, are various. A Fever sometimes more intense, sometimes more remiſe, with a low Pulse, quick, unequal, and a Heat for the most part not very violent. An Oppression of the Heart, with Melancholy; and a Palpitation often returning, and sometimes a fainting Fit, Head-ach, Deleriums or Ravings; sometimes Epileptic Convulsions, frequent Sneezing, Sleep more heavy than usual and unquiet, Dreams of Thunder, Fire and Flames, Waking with a Fright, difficult Respiration, with frequent Sighs; continual Gaping, Pain in the Back and Loyns, and Pulsation in the Spine, Heaviness and Weariness of the whole Body, a Pricking, and as it were Itching in the Skin and in the Nostrils; a Red Face, Dimness of Sight, yet Brightness and Itching of the Eyes, Tears without any force, sometimes Bleeding at the Nose, Swelling of the Face, Driness of the Mouth, Hoarseness, with a little dry Cough; trembling of the Extream Parts, small Red Spots in the Skin. But these Signs are the more certain, the more rife the Small-Pox are, or if there be any suspition of having caught them; as if the Person has been to visit any one that was Sick of that Disease, or had been frighted with the Sight of any one newly recovered: But there is no certain Sign of the Small-Pox at hand to be taken from the Urine. For that in this Distemper, the Urine for the most part resembles that of sound People.

If the Small-Pox, besides the outward Skin, have seized the Inner Parts, then you must judge which Parts they are, by the Disturbance of those Parts. For if the Stomach be infected, it will

appear by Vomit and Pain in the Heart. If the Guts, by their being griped, and a purulent Looſneſs withal: if the Lungs, by difficulty of Breathing; if the Kidneys, then the Urine will be bloody, and ſo of the reſt.

CHAP. V.

Of the Prognoſtic Signs.

THE Small-Pox, becauſe they are reckon'd in the Number of acute Diſeaſes, have their four Times like other more acute Diſeaſes. For if the Courſe of the Diſeaſe proceed conveniently, they are determined within fourteen days; which if they exceed, it is a Sign either of the Weakneſs of Nature, or of a great quantity of Morbific Matter, or both. Of theſe Days, the firſt is the Beginning, the ſecond the Augmentation, the third the State or Condition, and the fourth, the beginning of the Declination, at what time the Fever and Symptoms are wont to remit. The ſame fourth Day, which is the Declination of the Ebullition, uſes to be the beginning of the coming out of the Small-Pox. The Augmentation continues till the ſeventh Day; the State and Vigor of the Diſtemper appears upon the eleventh Day; from which till the fourteenth, is the Declination, and at that time the Pox are dryed up, which Exſiccation of the Matter ſometimes continues till the twentieth Day. If the Diſeaſe proceed without Interruption, according to this Order, we may hope for a good Iſſue, but if it do not obſerve this Order, there is no reaſon to expect other than the worſt. But the Event of the Diſeaſe, whether Death or Recovery is conjectured, by comparing the Strength of the Patient, with the greatneſs of the Diſtemper. The Strength of the Patient is collected by his bearing the Oppreſſion of the Diſeaſe, and by the Actions of his Body. The Greatneſs of the Diſtemper is gathered from the Greatneſs of the Fever and the Symptoms, and the Puſtles themſelves. If the Strength of the Patient be ſuch as to weather all the four Times of the Diſeaſe, he is happy: But if his Strength be vanquiſhed by the force of the Fever and the Symptoms, that it will hardly ſuffice to grapple with the State and Vigor of the Diſeaſe, the Event will prove very dubious. Therefore we are to judge of the Event by thoſe things which accompany and follow the *Small-Pox*. Such as are the Quality, Bigneſs, Number, Figure and Colour of the Puſtles, the time of their coming forth and Place, the Violence of the Fever, the various Symptoms, and the eaſineſs or difficulty of the Patience to undergo the Diſeaſe.

The good Prognoſtic Signs are theſe: At the beginning, before the coming forth of any Spots, Bleeding at the Noſe, a ſpeedy coming forth, and ſoon after, a Remiſſion of the Fever and other Symptoms. The Pox themſelves at firſt red, then whitiſh, ſoft, high rais'd, round, moderately full of Matter, diſtinct and not contiguous; a free Speech, and Eaſie Reſpiration. From theſe two latter, *Euſtachius Rudius* promiſes much toward Recovery. *That we may be able*, ſays he, *to conjecture Life or Death, it behoves us to conſider well the Voice and Reſpiration. For while thoſe two things are in a good Condition, all is ſafe. For they demonſtrate the Matter to be expell'd far from the Noble Parts, eſpecially from the Vitals.*

The bad Prognoſtics are theſe. A Fever, with grievous Symptoms remaining after the breaking forth of the Small-Pox. The Pox ſlowly coming forth and ſlowly ripening. Small and few, hard, depreſſed, and vaniſhing or ſinking again after coming forth: Livid, Violet Colour, Purple, Blackiſh, double in the middle, marked with a black Spot, and ſeated within the Fleſh. And theſe preſages of great Evil, are much augmented and aſcertained, by a great failing of the Strength, Pain in the Heart, Vomiting, Hickoping, extream Drought, great Sadneſs and Diſturbance of Mind, with frequent Faintings, Raving, dead Sleeps, or too much Watching, Epileptic Convulſions; a ſtreightning of the Breaſt and Chaps, difficulty of Breathing, Hoarſneſs, a Loathing of Food, Inability to Swallow, Looſneſs and Pains in the Belly, a Flux of the Courſes out of order, bloody Urine, the Extream Parts cold. To which we may add two things more. 1. If many have dy'd of the Small-Pox out of the ſame Family. 2. If they were old when they caught the Diſtemper.

Now they that dye of the Small-Pox, for the moſt part are ſuffocated, the Paſſage of the Spirits being ſhut up by the Puſtles, or elſe go away in a fainting

ing Fit, or else are carried off with a Looſneſs of the Belly, either bloody or without Blood.

If the Small-Pox have ſeized the inner Bowels, they cauſe a *Peripneumonie*, Conſumption, pernicious Exulcerations of the Liver and Kidneys, and other deadly Miſchiefs.

If they have ſeized the Eyes, they frequently cauſe a laſting Ophthalmy, a Lachrymal Fiſtula, corroſion of the corner Caruncles, Dimneſs and Miſt, a white Film, and many times Blindneſs.

If after the breaking of the Pox in the Ears or Noſtrils, there happens a *Hypoſarcoſis*, the Patient frequently looſes his Hearing and Smelling.

In the Face, if they cauſe an entire Cruſt like a Vizor, 'tis a Sign, that when they fall off, they will leave behind them Spots of an ill Colour, and deformed Pits withal.

CHAP. VI.

Of Prophylactic or Preſervative Phyſic.

IN this Diſeaſe, as well as in the Plague, there is required a double Cure; *Prophylactic*, and *Therapeutic*. Of the *Prophylactic* Cure, but few Phyſitians have wrote, either becauſe perhaps they thought it not ſo neceſſary, or becauſe ſo very few conſult the Phyſitian when they are in Health. Nevertheleſs, ſince that famous Phyſitian *Avenzoar*, not without good reaſon, adjudged it no leſs neceſſary than in the Plague, and for that there are ſeveral who are ſo terribly afraid of this Diſtemper, as well for that it hazards their Lives, as for the Pits and Deformed Scars it leaves behind, we ſhall here ſay ſomething briefly of the *Prophylactic* Cure, before we proceed to the *Therapeutic*, in ingard it is more ſafe and more noble to keep off a Diſeaſe, than to expel it out of Poſſeſſion; and therefore Preſervation is very neceſſary, more eſpecially ſince Contagion and Corruption of the Air are two of the chiefeſt Spreaders of this Diſeaſe.

In the Method of Preſervation, the Conſtitution of the Air is chiefly to be obſerved, the Corruption of which, extreamly conduces to the Propagation of this Diſtemper, as being many times the Medium to conveigh contagious Contamination to others. This Air, if it be vitious, is not to be corrected by great Fires, as is uſual in the Plague, (for fear of overheating the Body,) but by Fumigations of Juniper-berries, Frankincenſe, Maſtick, Benjamin, Amber, Roſemary, Citron and Orange-peels, Juniper-wood, Laurel, and the like. But nothing is more conducible than to ſprinkle the Chambers with Vinegar, or Oximel, and to receive the Fume of them into the Head, by powring them upon a red hot Prick; or often to ſmell to a Spunge dipp'd in Vinegar, and carried about in a perforated Ivory Box. For as all ſweet Smells that are very fragrant, ſo neither are all ſtinking Smells to be here admitted, only Vinegar is to be preferred before all Suffumigations, becauſe it not only corrects the Corruptions of the Air, and extinguiſhes the Contaminations that adhere to it. Moreover, to the end the contagious Contaminations flying about in the Air may be the better avoided, Children and others that never had the Small-Pox, are to be warned from viſiting, not only People that lye ſick of the Small-Pox or Meaſles, but alſo thoſe that attend them in their Sickneſs, or converſe with them upon any occaſion whatever, nor will it be ſafe to come near the Houſes where they lye ſick.

The next thing requiſite is a good Diet, and Meats of wholſome Juices and eaſie of Digeſtion: to which are moſt agreeable for Sallets and Sauſes, Sorrel, Vinegar, Juices of Limons and Oranges, green Grapes pickled, red Goosberries, ſowr Cherries, and the like. But on the otherſide, abſtain from Meats of hard Digeſtion, and bad Nouriſhment, from tart Meats and much ſeaſoned with Spice, Salt, and dry'd in the Smoak, Garlic, Onyons, early Fruit; alſo uſe Moderation in Eating, Overfulneſs being no leſs prejudicial than too much Faſting.

For Drink, uſe Ptiſans, or ſmall Ale, and for them that drink Wine, they muſt be allowed to drink ſmall Wines moderately. To the more Delicate, it will not be amiſs now and then to give Juleps of Decoctions of Barly, Juice of Citron, Sirrup of ſowr Cherries, Violets, Limons, and ſuch like things, that have a pleaſing and acceptable Taſte. On the other ſide, abſtain from ſtrong Wine, Brandy, ſtrong Hull and Margaret-Ales, and from

all other ſtrong and ſpirituous Drinks.

Let the Exerciſes of the Body be moderate, avoiding thoſe that are too laborious and overheat the Body, and ſuch as are too eaſie.

Sleep moderately likewiſe.

The next thing to be conſidered, is going to Stool, in which reſpect, beſides the uſual goings to Stool, Care ſhould be taken to purge the Body gently from ſuperfluous Humors, at leaſt once a Week, and that with *Pillulæ Ruffi*, or Pills of *Aloes Roſatum*, Leaves of *Senna*, *Rhubarb*, *Tamarinds*, and ſuch like Medicaments, for grown People; but let Children take Syrup of *Cychory cum Rheo*, or laxative Syrup of Corrents, and the like; but avoid ſtrong Purges, which diſturb the Humors and the whole Body. Care alſo muſt be taken that the monthly Evacuations of Virgins and Women that are not with Child, obſerve their exact Periods; and that there be no Stoppage of the Blood, as to thoſe who are troubled with Hemorrhoids at certain Intervals, take care that ſuch Blood have its due Evacuation.

As to Plethorics, and ſuch who have an abundance of Blood, Blood-letting will be very requiſite, if the Age of the Perſon will bear it, and there be no other reaſon to forbid it.

Tranquility of Mind and Courage are alſo in this Caſe of great Importance. More eſpecially, let a Man take care to avoid violent Commotions of Mind, as Anger, Fear, Frights, and fixing the Thoughts upon the Small-Pox and it's Deformity.

CHAP. VII.

Of Therapeutic Cure, and firſt of Dyet.

IN the Cure of thoſe that are ſick of the Small-Pox, the Phyſitian muſt aim chiefly at two things. The firſt is to aſſiſt Nature in the Expulſion of the Morbific Matter, and to remove all Impediments that hinder her Operations in that Particular. The other is to remove Accidents, and to take care, leaſt by that Expulſion, the Internal or External Parts receive no prejudice; and for the obtaining of theſe Ends, we muſt have recourſe to the three Inſtruments of Phyſic, Dyet, Chyrurgery, and Pharmacy.

There is a moſt exact Dyet to be obſerved in this Diſeaſe, in regard that many times by that alone the Cure is effected, and Errors committed in that, are often puniſhed with Death.

Here alſo the Air is greatly to be conſidered; let the Patient lye in a little Chamber cloſe ſhut, and free from any Wind, to the end he may the more eaſily breath, and that the ſtinking Vapors being the more eaſily diſcuſſed, may the leſs offend him. Let the Air be tepid, and as little of Cold come in as may be; if it be Winter or a cold Seaſon, the Air is to be corrected with luſty Fires. More eſpecially, take care that no Cold get into the Patients Bed. For ſhould the leaſt Cold come to him while he is in a Sweat or a moiſt Breathing, or if the Patient himſelf, by toſſing and tumbling ſhould throw of the Cloaths and check his Sweat, it frequently happens that the Pox fall in again and vaniſh, or ſink into the Skin, to the great Hazard of Life. For which reaſon, the Patient muſt not be ſhifted till after the fourteenth Day, for fear of ſtriking in the Pox again, to the irrecoverable Ruine of the Patient. Far better it is to ſuffer the Shifts of the Patient, moiſt with Sweat, to dry of themſelves with the Heat of the Bed, and for the Patient for ſome Days to bear with the Stench of the Sweat, and the Puſtles coming forth, than to change his Linnen and be the Cauſe of his own Death. But if there be an urgent Neceſſity for the Patient to change his Linnen, then let him have the ſame fowl Linnen that he put off juſt before he fell ſick, or that have been worn before by ſome other ſound Body. For I have often obſerved clean and newly waſhed Linnen to have been very prejudicial to ſick People, which I am apt to believe proceeds from the Smell of the Soap, which the Linnen in ſome meaſure retains. Moreover great Care is to be taken that the Shift be well warmed by the Fire, and that no Cold comes to the Patient while he puts it on. However, this is certain, 'tis better not to change Linnen at all; but to change before the fourteenth Day is a thing not to be done without extream Hazard. Nor is there any reaſon for any Man to be afraid of

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any bad Smell which the Linnen contracts from the Sweat and broken Puſtles, for that we never found it to be prejudicial to any that were ever ſick of the Diſtemper.

Laſtly, we thought fit to obſerve here that the Heads of thoſe that are ſick of the Small-Pox are not to be bound and wraped up in Linnen Caps, either too hard or too warm; for from thence ariſe two Inconveniences. 1. Becauſe the Heat of the Head being thus increaſed, the Pox break out thicker in the Face and Head, than if it be more ſlightly covered. 2. Becauſe that under Caps bound hard to the Head, the Pox riſe larger, flatter, and very broad, nay, many times under thoſe ſtreight Caps, they are ſo ulcerated, that after a troubleſomeCure they leave very ill-favoured Scars behind. For which reaſon, I always order the Head to be ſlightly covered, with juſt Linnen enough to keep it from the Cold, and by no means to bind it on hard.

Convenient Adminiſtration of Dyet avails alſo very much to the Cure of the Diſtemper. At firſt a very ſlender Dyet, more eſpecially from the beginning of the Diſeaſe to the ſeventh or fourteenth Day, chiefly of a little Barly-broth, or an Emulſion of Sweet Almonds, and the four cold Seeds boyled in Barly-water, or ſlender Chicken or Mutton-broths, endued with a cooling Quality, by the Addition of Lettice, Endive or Purſlain, *&c.* But let him abſtain from all manner of Fleſh, as alſo from Eggs and Fiſh, and all other Meats of ill Juice or hard Concoction; alſo from all acid, ſalt, ſharp things; from all Spices, Garlic, Onions, and all ſuch things as are very hot. If the Patient be a ſucking Infant, then the ſame Dyet is to be preſcribed to the Nurſe. But after the Pox are come out, that the Fever ceaſes, and that the Puſtles are ripe, and the Scabs begin to fall, then more ſolid Dyet is to be allowed; as Chickens, Lamb, Veal, Potch'd Eggs, *&c.*

For Drink, the Patient muſt make uſe of Ptiſans, or elſe a Decoction of raſp'd Hearts-horn; let him abſtain from Wine, unleſs in caſe of fainting Fits, and from all other ſtrong, hot, and heady Drinks. Now how prejudicial it is for ſuch a Patient to drink Wine, *Foreſtus* obſerves, *Some idle and unskilful Women and Nurſes*, ſays he, *there are, who will give Claret to Children lying ill of the Small-Pox and Meaſles, though at the ſame time having a violent Fever, vainly perſwading themſelves that ſuch Drink will bring out the Pox with more eaſe. Whence it comes to paſs, that many after they have drank that Aſtringent Wine dye of a ſudden, the Motion of Nature being check'd, and She thereby diſabled to expel the Diſtemper forth.* Others, the Fever being heightned, have been tormented with Head-ach, and fallen into raving Fits, and ſoon after dye Mad; very few, and they not without great hazard, eſcape.

Here by the way, let us take notice what *Mercurialis* obſerves, concerning ſweet things in Dyet. *But*, ſays he, *more eſpecially take care to abſtain from all ſweet things in Meat and Drink.* To which he adds, what *Avenzoar* writes, that they who uſe ſweet things at that time, are hardly to be recovered. But this Opinion does not agree with common Practiſe, by which we are taught, that Licorice, Figs, Jujubs, Raiſons, Sugar, common Syrrup, and ſuch like ſweet things, do the ſooneſt concoct and expel the Morbific Matter to the outward Parts, and therefore ſweet things cannot be hurtful in this Diſtemper. Only ſweet Wines are to be excepted, which being ſtrong, offend the Head, augment the Heat, and encreaſe the Fever. Beſides that, *Mercurialis* at another time confeſſes, that he was wont to preſcribe dry Figs for one ſort of Dyet in this Diſtemper.

Moderate Sleep will ſuffice, and let the Patient lye quiet in his Bed.

If he void his Excrements freely and naturally, 'tis very well. But if his Belly be hard bound, and full of Excrement, it will not be proper to move his Belly before the ſeventh Day, and not then neither, unleſs upon ſome extraordinary and urgent neceſſity. For the Belly being bound, does not hinder the coming forth of the Small-Pox; but if it be provok'd, there may eaſily enſue a pernicious Looſneſs.

Avoid all careful and anxious thoughts, and all vehement Perturbations of the Mind, as Fear, a Fright, Sadneſs and Anger. Though as for Anger, *Mercurialis* ſeems to be of another Opinion, and believes it may be profitable, *For*, ſays he, *Nor is it a thing to be regarded, if Patients in this Diſtemper are ſometimes angry, for Anger many times is uſeful to expel noxious Humors to the Superficies of the Body.* But I wiſh it may not contribute to increaſe the Heat and the Fever.

CHAP.

CHAP. VIII.

Of Chyrurgical Helps.

THE Primary Aſſiſtance of Chyrurgery is Blood-letting: concerning which there ariſes a notable Queſtion among the moſt Eminent Phyſitians; whether it be convenient in the Cure of this Diſtemper or no?

Avicen perſwades Blood-letting before the Puſtles come forth, as alſo after they are come forth if they be very full. *Raſes* allows it only before they are come forth; before they break forth, the Phyſitian may let Blood, if there be no other reaſon to the contrary, either by opening a Vein, or by means of a Cupping-glaſs with Scarification. For the Quantity is of neceſſity to be diminiſhed. *Foreſtus* writes, that this Remedy is of wounderful uſe, eſpecially in a Plethory, ſo it be made uſe of at the beginning and before the Puſtles begin to riſe; and farther he writes, that ſuch as are let Blood in Seaſon, are ſooneſt cured. *Amatus* the *Portugueze* produces ſeveral Examples of Children that ſcap'd by ſeaſonable Blood-letting and Cupping, when others dy'd, that would not admit that way of Cure. *Nicholas Fontanus* writes, that he has alwaies let Blood with ſucceſs in the Small Pox. *Sennertus* believes that Blood-letting is not to be uſed in Children; for that their ſtrength will not bear it. But where the Perſons are of maturity, ſo that they be very *Plethoric*, he deems it proper to be uſed, at the beginning and before the fourth day, or at leaſt before the Puſtles come out; while the Party is yet in full ſtrength; to the end that Nature being eaſed of ſome Part of her burthen ſhe may with more eaſe overcome the reſt. But after the fourth day, or when the Spots begin to appear, then he believes it ought to be altogether let alone. With this Opinion of *Sennertus* the Learned *Willis* agrees. Nevertheleſs there are ſome Eminent Modern Practitioners, who judge Blood-letting proper not only before but after the coming of the Pox, eſpecially in Plethorics; and this, in ſome meaſure to check the Ebullition of the Blood.

To decide this Controverſie, in the firſt place, there are two times of this Diſeaſe to be obſerved, the firſt before, the ſecond after the coming forth of the Pox. In the ſecond place we are to conſider with what ſucceſs Nature operates of her ſelf at both thoſe times by ſpontaneous evacuation of the Blood, to the end that the Phyſitian who is but Natures Miniſter in the Artificial evacuation by Phlebotomy, may be able to follow her in her ſucceſsful Actions, and avoid her improſperous Efforts. Now this is moſt evident to all Phyſitians by long Experience, that if there happens a free and ſpontaneous bleeding at the Noſe before the Pox come forth, it proves fortunate, and to the great eaſe of the Patient; for that then the Fever remits, and the Pox come forth with more eaſe and in leſſer number. But if ſuch a ſpontaneous Bleeding happen after the coming forth of the Pox, it generally proves unfortunate and pernicious to the Patient. The reaſon is becauſe that before their coming forth, Nature being eaſed of Part of her burthen, more eaſily expels what remains. And thus by this Operation of Nature the Phyſitian is taught what to do in Artificial evacuation, that is to ſay, that Blood-letting may be advantageous before the coming forth, but of ill conſequence after the coming forth of the Diſtemper: And thus I have obſerved for the moſt part that by a ſeaſonable opening a Vein in Plethoric Perſons, the Pox come forth not only more eaſily and with leſs trouble, but are alſo more ſuddenly ripened, which *Foreſtus* has alſo obſerv'd long before us. But if Phlebotomy be made uſe of after the Pox come forth, nature being then employed in concocting and expelling the Morbific matter, is very much debilitated and called off from that Employment, with ſo much prejudice to the Patient, that I have obſerved that moſt People have dy'd who have been thus let blood. For which reaſon 'tis always my cuſtom to inculcate into my Schollars, that if they be called in time to any Patient, before any ſigns of the coming forth of the Diſtemper, that if it be neceſſary they may open a Vein: But after the leaſt ſigns thereof appear, and that the red Spots begin in the leaſt to ſhew themſelves, that they forbear to let Blood, and endeavour to help Nature in her expulſion begun, by Antidotes, Diaphoretics and other proper Medicines.

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This Blood-letting also I am willing to admit if there be a necessity in Persons of grown years, and that are able to bear it; but in Children, before the seventeenth or eighteenth year, I do not approve Blood-letting notwithstanding that *Avenzoar*, and *Averroes* boast their successes in that sort of Practice, and and that many *Italian*, *French*, *Spaniards*, and among the rest *Amatus* the *Portugueise* are of the same Opinion. For though in those hot Countries of *Italy*, *France* and *Portugal* such Practice may have proved successful, I do not think it so safe to let Children Blood in our cold Countries.

In like manner neither does *Trincavellus* approve of this letting Children Blood, in regard the event proves often Fatal; or if it succeed, it is rather to be attributed to Fortune then Reason.

Eustachius Rudius, *Duncan Liddelius* and *Bauderon* order that if the Small Pox do not suddainly break out in Children, to lay House Swallows to the Back, Buttocs and Hips of such Children, or else to apply Cupping-Glasses with a slight Scarification to the same Parts, the first or second day. But this advice I do not like for two Reasons. *First*, Because 'tis very prejudicial to lay the Body open the first days (which must of necessity be done in the application of Swallows and Cupping-Glasses) and so give admittance to the cold Air, which checks the coming forth of the Small Pox. *Secondly*, Because it is very dangerous to wast the strength of Children, which is apt enough to decay of it self, by drawing away the Blood.

CHAP. IX.

Of Pharmaceutic Remedies, and first of Purgations.

PHarmaceutic Remedies are twofold, either Purgative or Expulsive.

As to Purgatives, there is not a little dispute among Practitioners, whether they ought not to be first prescribed in the Cure, and whether at the beginning, part of the Matter ought not to be evacuated, that Nature being eased of part, may more readily expel the rest. These Purgations many approve, and many reject. They that approve them, unanimously consent in this; that all strong Purgatives are to be forborn. But milder Purgatives they hold may be safely made use of, As *Pill. Ruffi.* Sena-leaves, Aloes Pills, Manna, Cassia, Tamarinds, and such other things as gently move the Belly, more especially such as are somewhat cooling. Others with *Averroes* will allow no Lenitives to be taken at the Mouth; but only that the Body may be gently mov'd upon urgent necessity with Glysters and Suppositories. These therefore differ but little from the Opinion of the other, who are absolutely against purging the Belly; of which number is *Nicolaus* the *Florentine*, who by the Appearance of the Pox, denys the use of Glysters. On the other side; *Willis*, I know not upon what grounds, is not contented with Purgatives only, but adventures to proceed to *Emetics*.

To decide this Controversie, we say, that a Physitian in this particular ought to be guided by Reason and Experience. Reason teaches us, that Nature when she has once begun her work well, ought not to be disturbed, nor to be hindred by any other contraty Motion, or to be called away from the business, which would be done, if that Motion which Nature endeavours from the Center to the Periphery, should be inverted by Purgatives from the Periphery to the Center. Experience tells us, that always in this Distemper, the Morbific Matter moves with success from the Center to the Periphery, (*but where Nature tends, thither we ought to lead by the common ways agreeable to the Law of Nature*) and that a Motion contrary to this is very unfortunate, whether voluntary or artificial, and that all Perturbations of the Belly whatever, and Vomitings are greatly prejudicial, nay for the most part pernicious; for that they presently check the Expulsion of the Pox, and strike those in again that were expelled; So that the Patients overwhelmed with pains and miseries, upon the failing of their strength, are brought to the period of their lives in a short time. It teaches us also, that all Lenitive Medicaments whatever though never so gentle, in this Disease procure a pernicious loosness (as we have observed in the Plague) and that the Small Pox is sooner expelled, if there is little or no Motion to Stool for the first day, then if there should be a loosness either Spontaneous or Artificial, and a frequent dejection. Therefore *Avicen* orders

ders that in the Progreſs and end of the Diſtemper, the Belly ſhould be ſtopt with moderate Aſtringents. Of the ſame Opinion alſo are *Raſes* and *Avenzoar*, and among the Moderns *Fracaſtorius*, *Mercurialis*, *Holler* and *Lazarus Riverius*, who thus writes upon this Subject. *When the Small Pox begin to appear*, ſays he, *enſuing Purgation is pernicious; eſpecially if the Malignity be in its full vigor, and at an Epidemic conjuncture, when moſt Children dye of the Diſtemper. And therefore it is better to forbear all manner of Purgation; for that in Malignant and Peſtilential Diſeaſes, Purgation at the beginning is extreamly prejudicial.* And therefore I would adviſe Phyſitians, that for the firſt few days they would think no more of looſening the Belly. Or if they judge it neceſſary for ſome extraordinary cauſe, that they give no Purgatives or Lenitives at the Mouth, but for grown People make uſe of Emollient Glyſters, and for Children and Infants of Suppoſitories only made of Honey. For long practice has taught me that this is the ſafeſt way of Cure; and that others, who pretended another way of Cure, have unfortunately killed ſeveral, nay the moſt of their Patients.

CHAP. X.

Of Medicines Diaphoretic, and Expellers of the Small Pox.

OMitting therefore Purgation for a time, and uſing Phlebotomy with great caution upon urgent neceſſity, the next thing for a Phyſitian to conſider, is whether Nature do her duty in Expulſion ſufficiently or no?

In the firſt Caſe there is no neceſſity to aſſiſt her with much Phyſic, eſpecially if there be no grievous Symptoms, for ſlight ones will eaſily vaniſh of themſelves, and the Small Pox will come forth ſufficiently, if there be care taken againſt the External cold, and keep the Patient in a gentle Sweat for the firſt three or four days. But if the Patient happen to be of the Number of the great Perſonages, or one of their Children, who will not be ſatisfy'd with ſuch plain and ordinary words of the Phyſitian, then you may preſcribe a ſmall quantity of Bezoar Stone, with Magiſtry of Pearls, or Crabs Eyes, or Eſſence of Corral, adding thereto ſome few Grains of Saffron, or ſome ſuch thing that will not diſturb Nature in her work and ſatisfie the importunity of Friends or Parents.

But if Nature ſeem inſufficient in the performance of her Duty, ſo that ſhe requires Aſſiſtance, we muſt have recourſe to other remedys, that may ſuccour Nature in her Endeavors.

Now among thoſe Expulſives, that are to be preſcribed upon the firſt coming of the Phyſician, are moſt of thoſe Diaphoretics and Antidotes, which we have ſaid are to be preſcrib'd at the beginning of the Peſtilence. *lib.* 3. *cap.* 5. out of which the Phyſician may chooſe thoſe that he thinks moſt proper for his Patient. For ſome are moſt proper for Infants and Children, others for grown People, others for the robuſt, ſome for the feeble, others for ſuch as have but ſlight Fevers, and others for thoſe whoſe Fevers are more violent. For the robuſt, the moſt generous Medicins are Treacle and Diaſcordium, with Salts of Wormwood, Carduus Benedictus and the like. For Children and Nice Perſons make choice of ſuch things as have a grateful Taſte, compos'd of the Species of Hearts-horn, coral, Pearls, Saffron, Alkermes, Hyacinth and ſuch like. But above all the reſt I never found any thing more effectual then our Treacle-water, which we have deſcrib'd in our Treatiſe of the Peſtilence. *lib.* 3. *cap.* 5. which has no ungrateful Taſte, and therefore may be given alone, or with ſome pleaſing Syrup to Children and Infants.

If the Small Pox do not come forth freely, in the firſt place let the Patient take ſome Sudorific, preſcrib'd after the following manners.

℞. *Treacle of Andromachus* ℥j. *Salt of Carduus Benedict.* ℈j. ſ. *Water of Carduus. Benedict.* ℥ij. *Mix them for a draught.*

℞. *Diaſcordium of Fracaſtorius, Treacle, of each* ʒ ſ. *Extract of Carduus Ben. Salt of Wormwood, of each* ℈j. *Decoction of Carduus Ben.* q. ſ. *Mix them for a draught.*

℞. *Diaſcordium* ℥j. *Hearts-horn burnt, red Coral prepared of each* ℈j. *of our Treacle-water* ℥j. ſ. *Syrup of dry Roſes* ʒ ſ. *mix*

℥ ſ. *mix them for a draught, if there be any fear of a looſeneſs.*

℞. *Of our Treacle water* ℥j. *or* ℥j. ſ. *double refined Sugar* ℥j. *mix them for a draught for very nice Children.*

℞. *Confect. Hyacinth, Diaſcordium, Harts-horn burnt of each* ℈j. *Mix them for a Bolus.*

℞. *Pulv. Liberants* ℈ij. *Saffron* gr. iiij. *Harts-horn burnt* ℈j. *Mix them for a Powder.*

℞. *Pearls, red Coral prepared, Harts-horn burnt of each* ℥j. *Manus Chriſti* ℈j. *Mix them for a Powder to be taken in ſome Cordial Liquor.*

℞. *Seed of Columbines and Turnip-ſeed an.* ℈ j. ſ. *of Noſeſmart ſeed* ℈ j. *make a Powder for ordinary People.*

℞. *New Sheeps dung* ℥vj. *or* ℥ j. *ſmall VVhite-wine, Decoction of Barley an.* ℥ j. ſ. *Mingle them together, and let them ſtand two or three hours, then ſtrain them gently, and give the Liquor ſtrained for one draught, which powerfully expels the ſmall Pox.*

After theſe and ſuch like other forms, Sudorifics may be conveniently preſcribed and exhibited. There is it requiſite in this Caſe to preſcribe many laborious Compoſitions as the ſame Phyſitians (eſpecially the Scholars of *Paracelſus*) with great Oſtentation will be ſtudying to do: in regard that a few are ſufficient for this Indication.

When the Patient has taken his Sudorific, he is to be well cover'd with Blankets and other Coverings, and ſo be provoked to Sweat. Nevertheleſs care is to be taken, leaſt being covered too hot, or lying in a hot Stove, he do not fall into a Swoon, for as in all other things, ſo there is a Moderation to be obſerved in this ſort of ſwoonding.

Here by the way we are to take notice, that *Fracaſtorius*, *Jo Paſchalis*, *Foreſtus*, *Riverius*, and many others recommend for the better provoking of Sweat, that the Patient ſhould be covered with red Coverlets; whether they believe that there is ſomething of a Singular property in red, which contributes very much to the Expulſion of the Small Pox; or that a Sweat provoked by ſuch red Coverlets, is more Efficacious to bring out the Small Pox; or that the looking upon red provokes the Colours outward, as *Veleſcus de Taranta* and *Duncan Liddelius* write. But they all ſeem to be under a great miſtake, who expect any thing particular from the red Colour of the Coverlets. For it is not the Colour, but the heat provoked by the Coverlets which cauſes the Expulſion of the Small Pox. But this ſame Errour ſeems to have derived its Original from hence, that formerly in the time of our great Grand-Fathers, the beſt and thickeſt Coverlets were dy'd of a red Colour, the thinner and courſer Sort were dy'd of other Colours; and hence it was that when the Phyſitians of thoſe times, ſaw it neceſſary for their Patients to be well covered, they ordered them to be covered with the beſt and thickeſt Blankets, which the ſucceeding Phyſitians not really obſerving, thought the preceding Phyſitians had ordered their Patients to be covered with red Coverlets, as if they had Experienced ſomething more notable and ſingular in a red, that in any other Colour to provoke the Small Pox.

After the Patient has Sweat well, according to the proportion of his ſtrength, the Cloaths may be ſomewhat lighten'd, to relieve him in his great Sweat. However he is to be kept ſtill in a moiſture, or gentle Breathing Sweat for a day or two, till the Pox are well come forward; taking great care nevertheleſs that his ſtrength be not waſted with two much heat. Thus *Foreſtus* orders the Patient to be kept in an Air moderately warm, and to keep him ſo covered with Cloaths and Coverlets, that he may ſtill lye in a kind of Breathing Sweat, taking care above all things that the heat of the Body be not too much augmented by heaps of Coverings, or heat of Stones, and ſo the Fever getting ſtrength, the Patient come to be ſtifled with a Syncope. This *Duncan Liddelius* alſo rightly admoniſhes.

Now to the end that during this ſame Breathing-Sweat the Expulſion of the Pox may have the more ſwift and better ſucceſs, our Country Folks are wont to boyl ſliced Figs in ſmall Ale, and give the Decoction lukewarm to the Patient with good ſucceſs. And *Foreſtus* highly extolls this Simple Decoction of Figs, and gives it all Children. However *Leonellus* does not boil the Figs

in ſmall Ale but in Whey, and very properly uſes that Decoction. Some will give the more ſprightly ſort of Children Figs to eat: nor do they do amiſs, ſo that their Stomacs will bear them. For Figs, which way ſoever they are uſed, are very wholſom in this Diſtemper. And this is the reaſon, why being boiled and mixed in Cataplaſms, and laid upon Tumors to ripen them, as they concoct crude Humors and haſten Suppuration, ſo being taken in Decoctions or eaten, they drive out the Small Pox, and cauſe a ſwift Maturation of them, as daily Experience tells us. Only when you uſe them, this one thing is to be obſerved, that neither they, nor their Decoctions muſt be given to them, whoſe Bellies are Laxative or over-looſe, or where a Looſneſs is feared; for they may excite a pernicious Flux, where the Patient is ſubject already to Looſneſs. Frequently therefore Phyſitians will not preſcribe the ſimple Decoction of Figs, but a Compoſition for the ſame purpoſe, ſomewhat of this nature.

℞. *French Barley cleanſed* ℥j. *Licorice ſliced* ʒij. *Red Vetches* ℥ j. ſ. *Turnep-ſeed, Fennel-ſeed an.* ʒ ij. *Figs* n°. xvij. *Water* q. ſ. *Make a Decoction according to Art to two Pints.*

To this Decoction ſome add Carduus, and Water Germander, others Lentils and Raiſins of the Sun, Parſley-ſeed, Culumbine-ſeed, Turnep, and others other Ingredients

Theſe two Decoctions are taken from *Avicen* and *Raſes*, much uſed and approved by ſucceeding Phyſitians.

℞. *Lacca waſhed* ʒ v. *Lentils peel* ʒvj. *Gum Tragacanth* ʒ iij. *Water* q. ſ. *make a Decoction to a Pint and half.*

℞. *Figs* ʒ vij. *Lentils peel'd* ʒiij. *Lacca.* ʒij ſ. *Tragacanth, Fennel-ſeed an.* ʒ ij. *Water* ℔ ſ. *Boil this to the remainder of the third Part.*

Such a Decoction alſo may be ſomewhat otherwiſe preſcribed.

℞. *Raiſins of the Sun ſtoned* ℥ij. *dry Figs* n°. x. *Lentils peel'd* ℥iij. *Lacca* ʒ j. ſ. *Fennel-ſeed* ʒij. *Parſley-ſeed* ʒ j. ſ. *Saffron* ϑ j. *Water* ℔ iij. *Boil them to two Pints.*

Garcias Lopez preſcribes a Decoction of the ſame nature after this manner

℞. *Dry Figs* n°. x. *Jujubes without Kernels* n°. xv. *Lentils peel'd* ℥ ij. *Seeds of Fennel, Dill, Parſley, Quinces an.* ʒij. *Lacca, Tragacanth, Roſes, Saunders an.* ʒ ij. *Water* q. ſ. *Boil them according to Art; and to the ſtrained Liquor add Saffron powdered* ʒ ſ.

But *Cardan, Jo. Baptiſt. Sylvaticus, Amatus* of *Portugal, Septalius*, and ſome others diſallow Lentils and Tragacanth. *Sennertus* approves thoſe compounded Decoctions only upon the ſcore of Experience, becauſe many Phyſitians have been ſucceſsful in the uſe of them, not that he gives any reaſon for it. But I will give my reaſon which is this, becauſe they ſomewhat thicken the Boiling Blood, and diſpoſe it to a quicker Maturation of the Blood: and therefore I think them fit to be made uſe of, not only at the beginning of the Diſtemper, to drive out the Pox, but a little after the beginning to haſten their Expulſion and Maturation as we ſaid, but now concerning Figs.

There are ſome who diſtill theſe Decoctions, and give the diſtilled Water to the Patients. But theſe are Fools in Chymiſtry, not knowing that Lac, Figs, Lentils, Tragacanth, and ſuch other primary viſcous and ſweet Ingredients, do not paſs through the Lembec in Diſtillation, whence of a good and effectual Decoction they make a Water altogether ineffectual.

If the Heat be not very intenſe, you may to very good purpoſe add to the Decoction of Figs the Roots of Elecampane, which proſperouſly promote Expulſion. Others add the Flowers of Marigolds.

Inſtead of theſe Decoctions, when the ſtrength of the Diſeaſe, and great neceſſity does not urge them, theſe pleaſing Emulſions may be aptly preſcrib'd for nice and curious Palates.

℞. *Sweet Almonds peel'd* ℥j. *of the four Cold ſeeds peel'd an.* ʒj. ſ. *Seed of Navews, Columbines, Carduus Benedict. an.* ʒj. *Barley water* q. ſ. *make an Emuſion to a pint; to which add refin'd Sugar, or for the richer ſort Manus Chriſti very clear* ℥ ſ. *or* q. ſ. *to render*

it

it gratefully ſweet. Mingle all together and make an Emulſion.

℞. *Seed of Carduus Benedictus peel'd, of Columbines, of Navews an.* ℥ij. *Melons* ℥iij. *Fennel and Carduus Waters an.* ℥iij. *adding of Manus Chriſti* q.ſ. *for ſweetneſs, mingle all together for Infants and Children.*

All the *Germans* make theſe Emulſions with the Diſtill'd Waters of Sorrel, Borage, Carduus, and Scabious, *&c.* But we aſcribe little ſtrength to them, and value more the Decoction of Barley, which may in ſome manner promote Maturation.

If there be any who with more diſcretion think fit to uſe Sweet-meats, they may be preſcrib'd after this manner.

℞. *Root of Elecampane Condited, Conſerve of Borage and Violets an.* ℥j. *Syrup of Elecampane* q. ſ. *mix them and make an Electuary.*

℞. *The pulp of large Raiſins of the Sun, and Figs, preſerv'd Orange-peel, Conſerve of Roſes an.* ℥vj. *Syrup of Orangs* q. ſ. *mix them for an Electuary.*

℞. *Pulvis Liberans* ℥j. *Harts-horn burnt* ℥ ſ. *Citron rind condited, Wallnuts preſerv'd, Conſerve of Marigold flowers an.* ℥vj. *Syrup of Wallnuts* q.ſ. *mix them for an Electuary.*

The Chymiſts applaud their diſſolutions, Magiſtery's and Eſſences of Pearls, Coral, Harts-horn, and the like, rather to be magnified for their hard Names then the benefit of their Operation: as by which great effects are promis'd to be done, but very little perform'd, and which ſeem rather to aim at the gain of the Seller's, then the Recovery of the Patient.

To all the foreſaid Medicines, if there be any Intenſe heat of a Fever, ſome cooling things may be added; as if you ſhould add to the Decoctions Borage, Succory, Lettice, Violet leaves, Endive, Bugloſs, Roſes, the four Cold ſeeds, *&c.* or to the Electuaries, Conſerve of Violets, Roſes, Water Lillies Powder of Diatragacanth, or Cold Diamargarit, Trochiſes of Spodium or Ivory calcin'd, and the like.

Beſides Internal Medicaments, *Bauderon* preſcribes for the quick driving out the Pox and provoking of Sweats, Epithemes which are a ſort of Decoctions, Fomentations, Emplaſters, Oyls to anoint the Pulſes, and the like to be outwardly applyed. But theſe do all more harm then good, and by means of the Ventilation of the Air, rather hinder then promote the provocation of Sweat.

However in the uſe of all theſe things a common Error of many Phyſitians is here to be taken Notice of, who intermix with their Medicaments Sorrel, green Grapes, Barberies, Ribes, Apples, Juice and Syrup of Limons, Tamarinds and ſuch kind of ſowr things, and this as they ſay to mitigate the heat, and ſtop the Ebullition. Certainly theſe Gentlemen are altogether out of the way. Let them if they pleaſe, by means of Acids mitigate the heat in Inflamations, burning and tertian Fevers, and ſuch like Vitious Fermentations of the Blood; but not in this Diſtemper, which is to be brought to a Criſis and Expulſion and ripening of the morbific matter by ſome exceſs of heat and Ebullition, and ſo to throw off the Diſeaſe. For Acids, becauſe they quell the heat and Sulphureous Ebullition which attends this Diſeaſe and hinder the neceſſary Concoction as alſo the Expulſion and Maturation of the morbific matter, and are hurtful to the Breaſt, are ſo prejudicial, that hardly any thing can be preſcrib'd more dangerous.

CHAP. XI.

Of the Cure of the Parts of the Body more Afflicted then others, and firſt of the Internal.

AFter General Curation which regards in the firſt place the Preſervation and Life of the whole Body, ſome few things are to be ſaid concerning the ſpecial Cure of ſome parts, which in this Diſeaſe are more Afflicted then others. Becauſe that the Morbific matter either is more eſpecially troubleſom to them, or falls upon them with greater force and in greater abundance.

Now the Parts more then others Afflicted are either Internal or External.

The principal Internal Parts are the Lungs, the Stomach, the Guts, the Liver and the Reins: and that they are Affected and greivously Prejudic'd is diſcern'd by the bad Performance of their Functions.

But although when theſe Parts, whether one or more be particularly afflicted, the danger of the Patients is ſo great, that very few ſo ſeiz'd, recover from the Diſeaſe and eſcape, nevertheleſs becauſe all do not dye but ſome are ſav'd, it behoves the Phyſitian to Deviſe what Cure may be done in theſe deſperate Caſes, and as much as may be to leſſen the cauſe of the Diſeaſe, and aſſwage the Symptoms, that ſo he may either reſtore the Patient to Health, or procure him a more eaſie Death.

In General the Decoctions of Lentils, Lack, and Tragacanth relieve all theſe Parts and Bowels ſo Afflicted. For Lack preſerves the Liver, Spleen and Kidneys; Lentils Corroborate the Inteſtines, and Tragacanth defends the ſpiritual Parts.

Particularly ſweet things are proper for the Lungs, Labouring under Sickneſs, as being thoſe things which promote Maturation, aſſwage Coughing, and facilitate Spitting.

Such are Syrup of Colts-foot, Licorice, Jujubes, Wild Poppies, Violets, Roſes, cold Diatragacanth, Diapendium, Powder and Juice of Licorice, Conſerves of Roſes, Borage, Violets, and the like, of which as occaſion requires, ſometimes Loches, ſometimes Trochiſchs, ſometimes Electuaries are made. Or elſe Pectoral Decoctions of Barley cleans'd, Colts-foot, Althea, Violet Leaves, Figs, Raiſins, Jujubes, *&c.* are ſweeten'd by their mixture.

Treacle at the beginning powerfully aſſwages Vomiting of the Stomach and Pains of the Heart. Afterwards ſome ſuch kind of Emulſion is to be Adminiſter'd.

℞. *Sweet Almonds cleans'd* ℥j. *four greater Cold ſeeds an.* ℥j. ſ. *Lettice and Columbine ſeed an.* ℥j. ſ. *White Poppy ſeed* ℥ij. ſ. *Barley water* q. ſ. *make an Emulſion for one pint. To which add Syrup of Poppies* ℥ij. *Syrup of Borage* ℥ſ. *Mix them.*

Outwardly a Fomentation may be applyed to the Region of the Stomach, of a Decoction of Mallows, Althea, Mint, Sage, Thyme, Marjoram, Flowers of Roſes, Camomil and Melilot, ſeeds of Aniſe and Cumin. After Fomentation for the greater Corroboration of the Part, anoint with this Liniments.

℞. *Oyl of Mint and Aniſe. an.* ℥j. *Expreſſion of Nutmegs* ℥j. ſ. *Oyl of Spike and Bricks an.* ℥j. *Mix them for a Liniment.*

After Unction, let this little Bag be lay'd on, ſprinkled with hot Wine, or elſe boyl'd a little in Wine, and gently ſqueez'd.

℞. *Leaves of Majoram, Roſemary, Sage, Flowers of Melilot and Roſes an. half a handful, Seeds of Dill, Lovage, Cumin, Nutmegs an.* ℥j. *Clove Gilliflowers* ℈ij. *make a groſs Powder, and ſow it in a little Linnen bag according to Art.*

Treacle, Mithridate, Diaſcordium, Hart's-horn burnt Crabes, Eyes Powdred, Terra Sigellata or ſealed Earth, red Coral, conſerve of red Roſes, or elſe the firſt Decoction of *Avicen* in the foregoing Chapter aſſwage the Gripings of the Guts, and ſtop the Flux of the Belly. Or elſe ſome ſuch kind of Almond Compoſition.

℞. *White Poppy ſeed* ℥iij. *Sweet Almonds cleanſed* ℥ij. *Decoction of Barley*, q. ſ. *make an Emulſion to a Pint, to which add, Syrup of Poppies and dry Roſes an.* ℥iij. *mix them together for an Almond compoſition.*

When the Liver is affected the ſame Amygdalate will be very proper, adding the four cold Seeds. Or elſe a Decoction of Barley with red Roſes and red Saunders ſweetned with Syrup of wild Poppies, Roſes and Violets. Or elſe an Electuary of Citron Rinds condited, Conſerve of Roſes, Borage, Violets, and Powder of the three Saunders, with an addition of Syrup of wild Poppies.

For

For the Kindneys, if the Patient makes Bloody Water, the following Emulſion is to be preſcribed.

℞. *Sweet Almonds cleanſed* ℥j. ſ. *the four cold Seeds an.* ʒj. *White Poppy ſeed* ʒiij. *Decoction of Barley* q. ſ. *make an Emulſion to a Pint. In which diſſolve Tragacanth powdered* ʒij. *Syrups of Wild Poppy, dryed Roſes and Cumphry an.* ℥ ſ. *Mix them together for an Almond compoſition.*

Liddelius in this caſe commends powder of Amber Trochiſchs of Yellow Amber, or Alkakengy, with an Emulſion of the four greater cold Seeds.

Theſe are the primary and cheif things which can be preſcribed and adminiſtred in theſe moſt dangerous caſes when the inner Bowels are greivouſly affected, according to which method Phyſicians may and ought to deviſe many others of the ſame Nature. For a Patient is not preſently to be abandond as uttterly loſt in the pangs of extremity and danger of Death (which would be an uncharitable act in Chriſtanity) but it behoves a Phyſitian to try his utmoſt and leave the reſt to God, who has many times reſtored to Health ſuch as have lain in a deſperate condition.

CHAP. XII.

Of the Cure of the External Parts.

THE External Parts which are uſually moſt afflicted by this Diſtemper are the Hands and Feet, the Mouth and Chaps, the Noſe, the Ears, the Eyes and Face.

At the coming forth of the ſmall-Pox, or when they begin to ripen, many times an extraordinary Pain and Itching afflicts the Perſons diſeaſed, in the hollow of their Hands, and the Soles of their Feet, becauſe the thickneſs of the Skin in thoſe Parts prevents their coming forth. You ſhall cure this ſymptom by fomenting thoſe Parts in warm water, or in warm water mixt with Sweet Milk, or in a mollifying Decoction.

If the ſmall Pox are come out very thick about the Mouth and Chaps, they cauſe a difficulty of Reſpiration and ſwallowing. In this caſe the Mouth is frequently to be waſhed, and the Throat alſo frequently gargl'd with the ſimple Decoction of Figgs, or if there be any Inflammation or violent heat, the ſame Decoction may be thus preſcribed.

℞. *Barley cleanſed* ℥j. ſ. *ſliced Figs* n°. xvij. *Raiſins of the Sun ſtoned* ℥j. ſ. *Leaves of Althea, Violets, Endive, Lettice, an. one handful and a half, flowers of pale Roſes one handful, of Elder one handful, Water* q. ſ. *make a Decoction of two pints to waſh the Mouth.*

When the Pox are ripe, to render the act of ſwallowing more eaſie, and cauſe a ſwifter breaking of the Pox, let the Patient frequently ſwallow a Pill about the biggneſs of a filbeard, of new Butter without any Salt, wrapt up in Sugar; for this wonderfully diſſolves the Swelling Pox of the Jaws. But if this happen to fail, and that the Pox remain whole, and that the difficulty of Breathing and Swallowing ſtill increaſes, then take a ſmall Spunge faſtened to a little ſtick, and having dipped it in Syrup of Violets, ſqueeze it ſtrongly againſt the Jaws, to the end thereby the Pox may be forcibly broken, and the narrowneſs of the Paſſage open'd. So ſoon as the Pox are broken, gargle with a Decoction of Barley, Plantain, and Red Roſes, ſweetened with Honey of Roſes and Syrup of Cumfrey. To defend the Noſtrils from the Pox, let the Patient very often ſmell to Venegar. Thus alſo *Foreſtus* writes, that *Benedict. Faventinus*, before breaking of the Pox, ordered their Patients to ſmell to Vinegar, wherein they had boil'd a quantity of Roſes. *Liddelius*, alſo and *Riverius* approve the ſmelling to Vinegar. But if the Pox happen to be very thick in the Noſtrils, annoint them often with a Feather dipped in Oyl of Sweet Almonds. But if they are grown into hard Scabs, and obſtruct the Noſtrils, and ſo procure a difficulty of Breathing, then ſtuff into the Noſtrils new Butter without Salt, by which means the Scabs being ſoftned, fall off, and the Obſtruction ceaſes The advice of others is, that the Patients ſhould ſnuff up into their Noſtrils theſe and the other Decoctions; but that Children cannot do; nor can grown People

People do it by reaſon of the Obſtruction. Only Butter thruſt up often into the Noſtrils does the buſineſs, ſo that there is no need of other troubleſom Remedies. But if there be any Exulceration in the Noſtrils, that is to be cured with a Liniment made of the Oyl of the Yolks of Eggs and juice of Plantain well mixt together in a Mortar. To which, if there be an occaſion of drying up the Matter more than ordinary, you may add a little Tutia Oyntment.

If the Ears ake and itch; let not the Patient handle them with his Hands: or if they run, let the Matter go, and take care that they continue open. But if the Pain be very much, dip a Spunge in the Decoction of the Leaves of *Althea*, Flowers of Gamomil, Melilot, and Roſes, Seeds of Fengreek, Dill and Cumin, and drop it lukewarm into the Ear.

The Medicinal Part that concerns the Eyes, conſiſts partly in Preſervation, partly in the Cure. To preſerve the Eyes from being over-run with the Pox, ſome waſh the Eye-lids with Plantain and Roſe water, wherein a little prepared Tutia has been infuſed, or mixed with a little white Seif and Camphire. *Bauderon* preſcribes to this purpoſe the following Collyrium.

℞. *Leaves of Black-thron-Buſh, Plantain, red Roſes an. half a handful, Boyl them in Smiths-water to* ℥iij. *In the ſtraining diſſolve Saffron* ℈j. *Camphire* gr. v. *The white of one Egg, and mix them together. Of this drop ſome few drops into the Eyes every hour, and lay little Rags dipped in the ſame upon the Eye-lids, and keep the Patient dark.*

Liddle preſcribes this,

℞. *Roſe-water* ℥ij. *Plantain-water* ℥j. *Powder of the Seed of Sumach* ʒij. *warm them over a gentle Fire, and ſtrain them with a good force. Add to the ſtraining Camphir* ℈ j. *Saffron* gr. v. *Mix them for a Collyrium, and let the Eyes be often moiſtened with a Linnen cloth dipped therein.*

Mercurialis adminiſters this,

℞. *Roſe-water, Plantain-water an.* ℥j *Sumac* ℥ ſ. *let them ſteep a whole night, and make a mixture with as much white of an Egg as ſuffices.*

Or elſe he takes Chalybeat, Milk mixt with Roſe-water; with which ſometimes he mingles a little Mirrh, to aſſawge the pain and itching. For my part I find nothing better then Saffron powdered and mixt with Cream of ſweet Milk. With which mixture let the Eyes be anointed with a Feather, touching with the ſame now and then the Caruncles in the larger corner, which I uſe with ſucceſs; when the Eyes are damnified, only adding thereto a little white *Sief.*

If the Eye-lids cannot be preſerved from the Small Pox, then it frequently happens, that they ſwell very much; ſo that the Eyes are cloſed by reaſon of the ſwelling. In this caſe obſerve, that the Eye-lids, notwithſtanding that ſwelling, are to be opened with the Fingers once or twice every day, to the end the humour abiding therein may be let out, which otherwiſe thickning within the Eye-brows begits a Whitſhot. But if by reaſon of the largeneſs of the ſwelling the Eye-lids cannot be conveniently opened, they are firſt to be fomented with a ſoft Spung dipt in Mutton broth; or a lukewarm Decoction of Leaves of Althea, Flowers of pale Roſes, and Melilot, and Seed of Fengreek, and after the uſe of this Fomentation for ſome time, then try again to ſunder the Eye-lids with your Fingers. If after the ſwelling is abated, and conſequently the Eye-lids freely open, any white Clouds like the white of an Egg, appear in the Eyes, dimming the ſight, blow a little white Sugar Candy finely powdered, through a quill into the Eye; with which and nothing elſe I have ſucceſsfully removed thoſe little Clouds. But if they chance to grow harder, and abſolutely blind the ſight, then add to the ſaid Sugar Candy a fourth or ſixth part of *Lapis Calaminaris* finely powdred together with the Sugar Candy. That powder wonderfully takes away thoſe Clouds and reſtores the ſight. But if the Eyes are Ulcerated by the Pox, they muſt be cured with this Collyrium.

℞. *Ceruſe waſhed* ℥iij *Sarcocol.* ʒj. *Gum Tragacanth* ℈ j. *Opium* gr. ij. *make Trochiſchs of this with Muſcilage of Tragacanth extracted in Plantain-water, which when uſe requires, are to be diſſolved in Womans milk, or Roſe-water.*

The

The care of the Face, like that of the Eyes, consists partly in Preservation partly in Cure.

Preservation is not intended, to prevent the breaking forth of the Pox in the Face (for if that should be hindred, the Distemper would seize the inner Parts, as the Brain, Meninx's, Eyes, and other Parts which would be a greater prejudice) but that the Small Pox being dried and falling off, may leave as few Scars and Pits as may be. To which purpose several Topics have been invented. Some, while the Pox are coming forth, frequently foment the Face with a Decoction wherein Pease have been boyl'd to an Extraordinary softness, as we say to mash. Others anoint the Face twice a day with a Feather dipp'd in Oyl of Navews with great success. *Forestus* recommends Oyl of Sweet Almonds, *Riverius* Oyl of Nuts. Others Bacon tosted at a hot Fire, and the dripping receiv'd into Rose-water, and so made into a soft Oyntment, which does well; and was generally used by that great Practitioner *Timannus Gesselius*. Others roast the Caul of a Boar-Pig at the Fire upon a Spit, letting the Fat drop into a Receptacle fill'd with Rose-water, and smear the Face all over with that mixture, and then cover all the Face with the Fat of the same Hog cut into thin slices. This they do twice a day, taking off the Old, and laying on fresh, till perfect Maturation of the Pox which happens sooner by that means, till they fall off: and this is a great secret among the Court Lady's. Certainly none of these ways are to be contemn'd, but excellent in their kind; and I believe they are many times to be made use of. Especially among the Richer sort and great People, that think the Physitians care do them more good by some notable Exploit, then Nature, by her own endeavours. However I generally give this advice to my Patients, that at the beginning they anoint the Face with a Spunge dipped in Mutton Broth after the Mutton is boiled from the Bones, having first taken away the fat which discolours the Face, and to use this several times in a day, till the Maturation of the Wheals; but after that to leave the rest to Nature. Nay I perswade many not to tamper at all but to leave the whole to Nature, especially if the Pox do not come out very thick. Moreover I chiefly recommend this to their care, that the Patient do not scratch and dig off the Wheals with his Nails. For Experience teaches us, that where the Pustles dry and fall off of themselves, without opening, they escape with fewest Pits or Scars: Which *Gracias Lopez* and *Forestus* also observe.

But here the Custom of the Courtiers may not improperly be examined, who more solicitous to preserve their Beauty then others, use to open the Wheals with a Golden Bodkin to let out the Matter, before it corrode, as they pretend, more deep into the Skin, and so make deeper Scars and Pits; which the *Arabians* and many Modern Physitians also prescribe. But we must tell them that we have alwaies found this opening very prejudicial, and that the Pits and Scars have been the deeper for that Operation; and *Riverius* is of the same Opinion. And this Experience is supported by two Reasons. *First*, That Pertoration ought not to be attempted, but when the Wheals are ripe and white: But in regard that when the Matter is white and concocted, it is a sign that all that sharp fervour, and power of corroding the Flesh or Skin is quite gone, especially the Wheals drying up of themselves, that Operation of the Golden Needle is altogether superfluous, seeing there is no feat of any farther Corrosion. *Secondly*, The matter being drawn forth by that same opening Operation, the Cavities are presently dried up by the ambient Air and grow hard; whence it comes to pass that the Flesh that lyes underneath, cannot grow up to fill the vacances. On the other side, if the Wheals are not opened, but the matter be permitted to dry up of its self, then the Flesh underneath is preserved soft, and so much grows up again, that before the Matter is fully dried up, the place of the Wheals are filled up again, so that when the Scabs fall off, there are hardly any Pits to be seen. This latter Reason therefore teaches us, that great care is to be taken to prevent the Patients from scratching off the itching Scabs with their Fingers, or pulling them off before they are dry'd. For certain experience tells us, that nothing causes deeper Pits or Scars than that unrulinesse. And therefore as to Infants and Children I alwaies advise that their Hands be so ty'd and swath'd up, that they may not be able to lift them to their Faces, and scratch off the Wheals that are upon it. And this is the Advice of the Author of the Book Entituled; *Of the property of things*, For, saith

ſaith he, *let the Nurſe or Phyſitian take care, whether they be Children or grown People, that the little Bladders of the Puſtles be not broken, either becauſe they itch, or for any other Reaſon; nor opened, ſpecially thoſe about the Face: For if the Wheals are once perforated and pricked, the Scars will be deep and laſting.* And this is confirmed by the Experience of *Foreſtus* alſo.

The *Arabians* were wont to waſh the opened Wheals with Salt-water, which *Paſchal*, *Rudius* and others approve. And many, with a Decoction of Saunders, red Roſes, Plantain, Myrtils and Sanicle. But ſuch Lotions are to be rejected; becauſe they dry up too quickly the Pits of the Pox, and ſo hinder the Fleſh from growing up, ſo that the Pits remain as deep as they were before.

Sometimes it happens that the Small Pox leave behind filthy Exulcerations which corrode the Skin; but theſe *Amatus* waſhes firſt with this Decoction.

℞. *Flowers of Red Roſes and Myrtils, Leaves of Lentiſc, Oaken tops, and Tamiriſh an. equal Parts. Water* q. ſ. *make a Decoction to waſh the Ulcers, and after you have wiped them with a Cloth ſtrow on this powder.*

℞. *Frankincenſe, Maſtick, red Roſes, Sarcocoll. an. equal Parts, make them into a very fine Powder.*

Foreſtus in the ſame Caſe, beſides the Camphire Oyntment, uſes alſo the following Oyntment of Lead, which *Duncan Liddelius* highly commends.

℞. *Burnt Lead* ℥ij. *Litharge* ℥j. *Ceruſe waſhed, vinegar an.* ℥ ſ. *Oyl of Roſes* ℥iij. *Honey of Roſes* ℥j. *Yolks of Eggs* n°. iij. *Mirrh* ℥. ſ. *Wax* q. ſ. *make an Oyntment according to Art.*

After the Small Pox is cured, ſometimes red Spots remain; for the more ſpeedy taking away of which, ſome there are that waſh them twice or thrice a day with a Decoction of Lupines and Beans, wherein ſome alſo boyl the Roots of Bull-ruſhes, and Southernwood-leaves. Others uſe the diſtilled Water of Flowers of Beans and Solomons Seal, mixing therein a little juice of Limons. Others waſh the Spots with Water of Cows-dung *Jo. Paſchal* commends the Lotion of Water of Roſemary. *Mercurialis* extolls the the Diſtilled Water of two Calves-Feet, as many Limons, and a ſmall quantity of Dragons. Others anoint them with the Oyl of Roſes or Pomatum mixt with Tartar. But I have obſerv'd by long Practiſe that they wear away ſooner, if nothing at all be done to them, for the External Air, after the Exulcerations of the Small Pox is over, drys and hardens by degrees the new Skin, by which means the Colour of thoſe Spots wears off, and at length wholly vaniſhes, when the new Skin has acquir'd an equal hardneſs with the former. And therefore I never preſcribe any Lotions or Oyntments to that purpoſe, in regard they do but retard the hardning of the Skin, and removal of the Spots; and for that I find the External Air to be the only Remedy againſt thoſe Spots. But If I meet with any Court Ladys that will not be ſatisfy'd without a Topic remedy, I recommend to them a Lotion of Bean Water, mixed with a little Water of Tartar and juice of Limons, or elſe a Lotion of Virgins Milk.

To take away the Pits and other Foot Steeps of the diſeaſe many uſe Man's Greaſe, or Mutton Suet; and many preſcribe ſeveral other Oyntments and Linements. *Bauderon* in his preſcriptions, to this purpoſe ſays he, very much conduces Water of Honey diſtill'd with Turpentine. Alſo Aſſes Fat melted with Oyl of Lillies: as alſo Oyl of Eggs and Bricks. The Blood of a Hair or Bull apply'd hot fills up the Pits. Alſo that which they call the Sword or Rind of Pork or Bacon if the Pits be rub'd therewith, ſmooth the Skin and fill up the Pits. Gooſe, Ducks, and Hens Greaſe work the ſame effect, as alſo the Aſhes of a Rams or Goats Hoof, if it may be ſo call'd, or of Egg-ſhells ſerve to the ſame purpoſe; and to ſmooth the little riſings in the Skin he preſcribes.

℞. *Oyl of Lillys, Gooſe Greaſe, and Aſſes Greaſe an.* ℥j. *Citrine Oyntment* ℥ ſ. *mix them and anoint the Tubercles going to Bed for ſeveral Nights together.*

The next day waſh the Face with their Decoction.

℞. *Roots*

℞. *Roots of white Lillyes* ℥ij. *Cuckow pint or Dragons* ℥i. *One Citron, thin Bran one Handful, Water* q. ſ. *Boyl them for a Lukewarm Lotion every day.*

Foreſtus among other things excels the following Oyntment.

℞. *Oyl of Sweet Almonds, white Lillyes an.* ℥j. *Capons Greaſe* ℥iij. *Powder of Pyony, and Florence, Orice Root, Litharge of Gold an.* ℈. ſ. *Sugar Candy* ℈j.

All theſe being well mixed in a hot Mortar, and preſs'd through a Linnen Cloth, anoint the Places Morning and Evening, afterwards waſh with Diſtill'd Water of Calves-Feet, or Water of Cow-dung.

But all theſe things ſignifies little, for when once the Pits of the Small Pox are dry'd, and that the Scars are either too hollow or too high raiſed, the Skin is fixed, then all Topics are in vain. But if the Colour of them be too red and unſeemly, the Colour perhaps may be taken off by Virgins Milk, or elſe ſome of thoſe other preſcriptions for taking away the Spots; but as to the filling up of the Pits, there is nothing to be done. Add to this that Greaſe of Men, ſheep, Aſſes, Geeſe and the like do ſo darken and ſmut the Skin, that they cauſe a greater deformity, then the Pits and Scars themſelves.

CHAP. XIII.

Of the Meaſles.

THE Meaſles are Spots or ſmall red Tubercles, breaking forth in the Skin, but never ſuppurating, ariſing from a peculiar Fermentation of the Blood.

They differ accidentally, or according to the more or the leſs from Small Pox; Becauſe the Small Pox riſe up high and ſuppurate; but the riſing of the Meaſles is hardly conſpicuous, and never ſuppurate: And therefore they ſooner go off and with leſs danger then the ſmall Pox; and moſt frequently ſeize Children, very rarely People of ripe Years or Old Men, or ſuch as have had the Small Pox before: For they that have had the Small Pox, are generally if not always, exempted from the Meaſles, though 'tis true they can Challenge no, abſolute Immunity.

They generally ſeize the Skin and the Epidermis, where they come forth and are ſeen. But whether like the Small Pox, they ſeize the Internal Parts or no, is much to be Queſtioned, nor do I indeed believe it, in regard I do not find that hitherto any Phyſitian has ever found it to be ſo.

They riſe from the more ſubtil, hotter, and dryer Sanguineous Humour, inclining to Choler, fermenting after a Specific Manner, which is the reaſon that they quickly come forth, and never riſe into Wheals, like the Small Pox, nor into any other conſiderable ſwellings, but coming forth ſmall at the beginning, they become red, broad Spots, with a ſlight roughneſs of the Skin. After the Seventh day, and many times ſooner, they vaniſh without any Exulceration, not the leaſt Foot-ſteps remaining nor any deformity left behind.

The cauſe of them is the ſame as the cauſe of the Small Pox; but the difference of the two Diſeaſes conſiſts in this, that the matter out of which they are generated, in the Small Pox is thick, Sanguineous and moiſt, which is the reaſon why they riſe into Whealks; but in the Meaſles thin, dryer and ſomewhat Choleric.

For the moſt Part they ſeldom ſeize the ſame Perſon above once; nor do they ſo frequently as the Small Pox return Twice or Thrice, becauſe the matter of theſe being much thinner, upon the firſt ſeizure is generally diſſipated and conſumed.

They are accompany'd with a Fever, like the Small Pox; nay, they ariſe from a Fever, of which they are a kind of critical Evacuation.

The Diagnoſtic Signs that ſhew the Meaſles to be at Hand, are the ſame which portend the approach of the Small Pox, and when they are come forth, the Sight is the Judge.

The Prognoſtics are, if they quickly appear, with a Diminution of the Fever, Anxiety and other Symptoms, and perſiſting in their height for Three or Four days, afterwards vaniſh by degrees. The Evil Prognoſtics, if they

come forth ſlowly, are accompany'd with bad Symptoms and diſappear again the firſt day. Moreover they have many other Prognoſtics common with the Small Pox which are deſcribed. *cap.* 5. before.

The Cure at the Beginning differs nothing from the Small Pox, for that the Patients are to be put into a Sweat by the Sudorifics preſcribed *cap.* 10. before, and kept in a gentle Breathing Sweat till they are wholly come forth: No cold muſt come to them; but the Decoction of Barley, Licorice, Vetches and Figs is frequently to be given them; for that expels the Meaſles as ſucceſsfully as the Small Pox; and their Method is to be obſerv'd till they diſappear again of their own accord, and with all the Signs of Health.

There is no need of Topics here. However ſometimes it falls out, that there will be a vehement, moſt troubleſom and intollerable Itching and Prickings in the Soles of the Feet, and Palms of the Hands; for the mitigation of which Symptom, then to hold the Hands and Feet for ſome time in cold Water; For by that means that Pricking is aſſwag'd, and the Meaſles in the Soles of the Feet and the Palms of the Hands break out more eaſily. This Experiment was formerly a Secret of *Nicolas* the *Florentine*, from whom *Baſius Aſtarius* of *Pavia* borrow'd it. Concerning this matter *Foreſtus* has a Singular Obſervation. *lib* 6. Obſerv. 42.

Next akin to the Meaſles is that Diſtemper, which ariſing from the ſame Cauſe, and requiring the ſame Cure, is call'd the Purples. Of which *Haly Abbas* thus ſpeaks, *There is*, ſays he, *a ſort of Diſtemper called Rubeola, which ariſes from a hot, ſubtil, and not very much bad blood; and this ſort when it comes to its height, is like the Grains of Millet, or ſomewhat bigger, and the Color of it Red; nor are the Puſtles to be opened, but inſenſibly diſſipate and vaniſh.*

In this Diſtemper red, and as it were fiery Spots, intermixed with ſmall Tubercles like Millet ſeed, with a ſwelling hardly worth ſpeaking of, break forth over all the Body at the beginning of the Diſeaſe, as it were a kind of St. *Anthonies* fire, that is the firſt, ſecond, third, or fourth day. In the height of the Diſtemper the whole Body ſeems to be red, as if it were under a general St. *Anothonies* Fire. But in the Declination the redneſs is diminiſhed, and the broad Spots, as at the beginning again appear, which at length upon the fifth, ſixth, ſeventh, eighth or ninth day vaniſh, the upper Skin peeling off like little Scales.

This Diſeaſe for the moſt part infeſts Infants and Children, very rarely People of ripe years, and like the Meaſles for the moſt part ſeize upon the Skin and Epidermis, and is eaſily cured, if you take care of keeping the Patient warm. Nevertheleſs it happens that ſometimes the Internal Parts are ſeiz'd by this Diſtemper, to the great hazard of the Patients Life. Thence an Intenſe Fever, violent heat and extraordinary thirſt; many times Inflamations of the Chaps, Lungs and other Bowels, with difficulty of Breathing, extream heavineſs, deliriums, tenſion of the Hypochondriums, and other evil Symptoms. In reference to which Subject *Sennertus* tells a remarkable Story of ſuch a Patient, *l.* 4. *de Feb. c.* 12.

A TREATISE OF THE SMALL-POX AND MEASLES.

FOR the greater Perfection and more ſolid Confirmation of what has been ſaid before, we will add the Hiſtories of ſome Patients, which we have met within our Practiſe, not common, but ſuch wherein there may be ſomething ſingular obſerved.

HISTORY I.

IN the Year 1640. After a moiſt and warm Winter, followed a hot and moderately dry Summer, wherein Fevers Tertian, Quotidian and Intermitting ſeized abundance of People. About the middle of *July* the Small Pox and Meaſles began to be very rife. In *Auguſt* they greatly increaſed, eſpecially the Small Pox: and ſo continuing to the end of that Year carry'd off a great many to their Graves. More then that, they who in thoſe two Months fell ſick of other Diſeaſes, were alſo in a ſhort time after ſeized by the Meaſles, but chiefly by the Small Pox.

At that time we ſaw ſeveral, who having had the Small Pox very thick, have afterwards had them a ſecond time; and that ſecond time

they break forth in greater quantity than the firſt. Nay, it has been known, that ſome have had the Small Pox, and been very full too, three times within the ſpace of ſix Months. Though it be a thing that rarely uſes to happen, eſpecially in ſo ſhort a time.

Theſe Diſeaſes took their Riſe from a continual Fever, which in ſome is more intenſe, in others more remiſs, with a Pulſe for the moſt part oppreſſed, weak, thick and unequal. For the moſt part the Symptoms were very bad; an extream heavineſs, oppreſſion of the Heart, dryneſs of the Mouth, tremblings of the extream Parts, Deliriums, *&c.*

In many the Small Pox come forth after the firſt or ſecond, but in moſt not before the third fourth or fifth days; where they appeared later the Patients were in great danger, and many dy'd; for oft-times the ſtrength of the Patient was ſo waſted by the violence of the Diſtemper, that at length, when the red Spots, the Harbingers of the Small Pox appeared, Nature was ſo feeble that ſhe could not expel them with that vigour as ſhe ought to have done.

They that vomited or coughed up Blood, or Piſs'd bloody, they generally dy'd, not one in ſix hundred eſcaping. For their internal Bowels being ſeized with the Small Pox, were ſo corrupted that they could never be reſtored to Health.

Such as had the Small Pox very thick in their Mouths, Tongues, Palate, Chaps, *Aſperia Arteria*, and Gullet were very much troubled to fetch their Breaths, and to ſwallow before the maturation and breaking of the Wheals; which was the reaſon that many were ſtiffled.

They who were Purged by unskilful Phyſitians at the beginning for the moſt part died; In regard the Small Pox come forth more Naturally, when the Belly is bound then when it is looſe.

Our Treacle water was much more prevalent to provoke Sweat in Children, then any other Diaphoretic.

After breaking, the Decoction of Figs drank very much aſſiſted to expel the Pox, eſpecially if Sycory, Carduus Benedict. Scabious, red Vetches, and other ſuch things were added. However it was not to be adminiſtred if the Belly were looſe.

The common People and Country folk, ſteeped Sheeps dung and Horſe dung in Wine or Ale, and then ſtraining it through a Linnen Cloath, gave it lukewarm with good ſucceſs to their Patients.

But the greateſt part of the Cure conſiſted in keeping all manner of Cold from the Patients.

ANNOTATIONS.

1. OF the Uſe and Vertue of Figs, and their Benefit in the Cure of theſe Diſeaſes, and the Decoctions uſually made of them, we have diſcourſed at large *cap.* 10. before. *Avicen* alſo thus ſpeaks of their Vertues. *The water of Figs*, ſays he, *is good*; for Figs are vehement expellers to the outward Parts, and that is one way to eſcape the Diſaſter of the Small Pox.

2. This very advice concerning Cold has *Avicen* alſo taken notice of, when ſays he the Small Pox begin to appear, then the catching Cold will be the occaſion of a great miſtake, for that it detains the ſuperfluity within, and carrys it to the Principal Members, and for that it is impoſſible for the Small Pox to come out and appear; thence proceeds reſtleſneſs, narrowneſs of the Throat, and ſometimes ſwounding. Therefore the ſuperfluities are to be aſſiſted with ſuch things as make them boyl, and open Oppellations, as Fennel and Parſley with Sugar and their Juices, or ſome Decoction of their Roots and Seeds.

HISTORY. II.

THE Daughter of *John Craſſelt* eight Years of Age, fell ſick of the Small Pox; which for the firſt three days came out very thick over the Skin of the whole Body. The fourth day ſhe had a Hoarſneſs with a little Cough and pain in her Belly. The Fever alſo from the beginning till this time continued in the ſame degree. The ſixth day a purulent Diarrhea, with griping of the Inteſtines followed, and ſhe coughed up much purulent bloody Matter. No Remedies availing, and her ſtrength being waſted, ſhe dy'd the Eighth day.

ANNOTATIONS.

IN this Patient, there is no queſtion to be made but that the Small Pox had ſeized the Internal Bowels, the Guts and Lungs, and perhaps the Liver, and other Bowels, the affections of which in this Diſtemper are Mortal. Now that the Internal Bowels may be ſeized by the Small Pox, our own Eyes will convince us, as *Fernelius* tells us. *It is often found* ſaies he, *that ſeveral who have been Diſſected after their Deaths have had their Liver, Spleen, Lungs, and all their inner Bowels all over covered with Mattry Puſtles like the Skin.* *Paræus* alſo obſerves the ſame thing. This ſays he, *Richard Hubert* the Chyrurgion and I ſaw in two Girles the one four the other ſeventeen years of Age; who both dying of the Small Pox were both Diſſected, at what time their internal Bowels appear'd covered over with Scabby Puſtles like thoſe upon the Skin.

HISTORY III.

THE Wife of *James de Clear*, a Woman of thirty years of Age, was taken with a Fever not very violent, together with a kind of Drowſineſs, pain at the Heart, a heavineſs of the Head, and a ſlight intermitting Delyrium. Now becauſe the Small Pox were then very rife, I ſuſpected the Small Pox would follow theſe Symptoms, becauſe ſhe had never had them before. For the Cure therefore having firſt looſened her Belly with a Gliſter, I gave her this Sudorific.

℞. *Treacle, Diaſcordium of Fracaſtorius an.* ℥ ſ. *Salt of Wormwood* ℈j. *Treacle water* ℥ij. *mix them for a Potion.*

This taken ſhe fell into a good Sweat; but the Diſeaſe continuing in the ſame ſtate, the ſame was given her again the next day, with like ſucceſs, for all that ſweating would not move the Diſeaſe. Then I preſcribed her to drink this Decoction; and ordered her to be kept three days in a gentle breathing Sweat, which ſhe eaſily endured; as being a Woman of good diſcretion, and very obedient to her Phyſitian.

℞. *Barly cleanſed, Fennel Roots an.* ℥ j. *Elecampane Roots* ℥ ſ. *ſliced Licorice* ℥ij. *red Vetches* ℥ j. ſ. *Scabious half a handful, Fennel ſeed* ℥ j. ſ. *Figs* n°. xvij. *Water* q. ſ. *make a Decoction to two Pints.*

When ſtill no ſigns of the Small Pox appeared, again I looſened her Belly with a Glyſter, and the next day ordered a Vein to be opened in her Arm, the third, taking the Decoction ſhe ſweat moderately, and ſo continued for ten days uſing the ſaid Decoction; afterwards becauſe the

the Fever and Heavineſs ſeemed again to increaſe, and for that ſhe waxed more drowſy and reſtleſs,I again gave her the Diaphoretic above mentioned, adding, *Extract of Cardnus Benedict.* ʒ ſ. which when ſhe had taken and ſweat violently, the forerunners of the Small Pox began to appear up and down upon her Skin, that is to ſay, the red Spots: then ſhe continued in a gentle breathing Sweat for two days,ſtill drinking the Decoction before mentioned, and in that time the Small Pox were very much riſen, and the Fever with other Symptoms vaniſhed by degrees. All the time of the Diſeaſe ſhe took no other Food then thin Broths; and every other day ſhe had once a day a Stool voluntarily.

ANNOTATIONS.

IN this Patient I almoſt deſpair'd of any coming forth of the Small Pox, and thought I had been deceived in my judgment, for I could not believe they would have come forth ſo late, that is to ſay upon the twentieth day; neither did I ever ſee them break forth ſo late in any other Perſon. Hence it appeared that *Hippocrates* was in the Right, where he ſays, that Remedies when they are truly adminiſter'd are not to be changed, ſo long as there is no other urgent Indication that requires an Alteration.

HISTORY. IV.

THE Son of *Edward Wilmer* ten Years of Age, ſo ſoon as the Fever had ſeized him, and that the Small Pox began to appear in ſeveral Parts of his Body, one *Edmund* an *Engliſh* Chyrurgeon was ſent for, who to free the Patient from the Heavineſs that oppreſſed him,gave him ſome Purging Medicine; this in a ſhort time encreaſed his drowſineſs; a terrible Looſneſs followed,together with an extraordinary waſt of the natural ſtrength. Preſently the Pox fell, and the Child died the next Night.

ANNOTATIONS.

HIppocrates ſays thus, *Where Nature leads, there we ought to follow, if ſhe lead by ways agreeable to the Law of Nature.* But in the Small Pox Nature leads from the Center to the Periphery, and that this is the moſt convenient way for the Evacuation of the Malignant Matter fermenting and boyling, the Experience of many Ages has taught us; therefore in the Cure of this Diſeaſe, a Phyſitian ought in the firſt place to obſerve Nature, either to let her do her own work of her own accord, or if ſhe be feeble, to aſſiſt her in her Action: But he muſt not diſturb her true Motion, with a Motion contrary to it, and when the Malignant Matter is wholſomly and regularly driving to the Exterior Parts recal it back to the Innermoſt and more Noble Bowels. For, ſays *Hippocrates*, ſuch things are to be fetch'd out of the Body, which coming forth of themſelves are conducible to Health; but thoſe things that come forth violently are to be reſtrain'd, ſtopp'd and retain'd. But ſuch things as we ought to fetch out are not brought forth by Evacuation through the Guts, neither do they come forth according to the regular Motion of Nature, nor by ways agreeable to the Laws of Nature; therefore in this Diſeaſe Evacuation by Glyſters is not to be provoked through the Inteſtins by Glyſters, or if it come forth of its own accord it is to be ſtop'd as ſoon as may be. Hence, ſays *Rhaſes*, great care is to be taken, after the coming forth of the Puſtles whether high or broad, leaſt the Belly be looſened with Medicaments; for they preſently cauſe a Diſentery, eſpecially where the Puſtles are very high; thus alſo *Avenzoar* never preſcribes any Purging Medicaments to thoſe that are Sick of the Small Pox, and forbids the Belly to be looſened, unleſs

unleſs by the help of a Suppoſitory, if the Patient be to hard bound. This *Egmund* the Chyrugeon never underſtood; and ſo by his Ignorance kill'd the Patient; as it happens to ſeveral others, who ſlighting the Learned Phyſitians, had rather purchaſe Death with Gold from ignorant Mountebanks and Homicides then buy Health with Copper from prudent and knowing Phyſitians.

HISTORY. V.

TWO Siſters, Young Gentlewomen both, the one of Twenty Four, the other of Twenty Six Years, at a Seaſon when the Small Pox were very rife, were extreamly afraid of the Diſeaſe. It fell out by accident, as they were going to Church, a Young Lad, newly cured of the Small Pox was got abroad, and coming along in the Street, at leaſt thirty Paces diſtant from them, having his Face all ſpotted with red Spots, the remainders of the Footſteps of the Diſeaſe; with which ſight they were ſo ſcared that they thought themſelves infected already: Thereupon I being ſent for to viſit the Young Ladies, endeavour'd by many Arguments to diſpel theſe idle fears; and for the better ſatisfaction of both, preſcribed them a gentle Purge, which after they had taken, the next day but one, I ordered a Vein to be opened in the Arm, and deſired them to pluck up a good heart; and to the end they might believe themſelves to be the more certainly ſecured from the Diſtemper, I forbid them the eating of all ſuch dyet as might contribute the procuring of this Diſeaſe, preſcribed them certain Apozems of Succory and other cooling things to Drink; and ordered them to walk abroad, viſit their Friends, and by pleaſant Diſcourſe and Converſation, and all other ways imaginable to drive thoſe vain conceits out of their Minds. But all that I could do ſignified nothing, ſo deeply had this conceit rooted it ſelf in their Imagination; For after fourteen days of Health, wherein they continually walked abroad and were merry with their Friends and Acquaintance, yet all the while the Small Pox ran in their Minds; at length, without any occaſion of Infection, they were both together ſeized with a Fever, and the next day the ſmall red Spots appeared in their Face and Hands, which after I had given them the Decoction of Figs, in a ſhort time after coming farther out, terminated in the Small Pox, which came forth very thick as well upon the Body as the Face, and ſo the Fever, the Heavineſs, and other Symptoms ceaſed by degrees, and they themſelves, forbearing to ſhift their foul Linnen in fourteen days, and committing no Error in their Diet, but obſerving my Preſcriptions exactly, without ſcratching off the Pox with their Nails, were both cured with very little or no prejudice to their Beauty.

ANNOTATIONS.

HOw wonderful the Strength of Imagination is, we have experience in many Perſons, for that by the Motions of the Mind it frequently works Miracles. And thus in theſe two Gentlewomen through a continual and conſtant Cogitation cauſed by the Preceding Fear, that Idea of the Small Pox ſo ſtrongly Imprinted in their Minds, and thence in the Spirits and Humours, begat therein a diſpoſition and Aptitude to receive the Small Pox.

I remember the ſame Year, I went to Viſit a Noble *German*, who Dreamt that he was drawn againſt his Will to viſit one that was Sick of the Small Pox, and was very much Disfigur'd; which Dream made ſuch an Impreſſion in his Mind, that he could by no means drive it out of his thoughts. He lived free for three Weeks, but then falling into a Fever was pepper'd with the Small Pox.

HISTORY VI.

A Certain Apothecary that was a ſtrong Man about Thirty Years of Age, going into a Citizens Houſe, when he found and ſaw of a ſuddain his Patient all over covered with the Small Pox upon his Face, he trembled a little at the ſight of ſo much deformity, and ſo departed. A little after to drive the Whimſey out of his Head he drank very hard; nevertheleſs all he could do could not put that Fancy out of his thoughts, which the ſight of ſuch an Object had imprinted in his Mind; though he were otherwiſe, a Man of an undaunted Courage: So that the ſixth day a Fever ſeized him with an extream Heavineſs, a reſtleſs ſleep, and a kind of ſlight Delirium; which after twice taking of a Sudorific Decoction, was attended with the red Spots that uſually fore-run the Small Pox, which within the ſpace of twenty four hours came forth very thick, upon which eruption the Fever and all the Symptoms vaniſhed, and the Patient being reſtor'd to his Health, went abroad again in three weeks.

ANNOTATIONS.

I would not adviſe any Perſons that are timorous to come near thoſe that are Sick of the Peſtilence or Small Pox; for if the Sight of one that lay Ill of the Small Pox, could move a Man of that courage as this Apothecary was, how much more would it have affected a timorous Perſon, now it may be queſtioned whether this Apothecary might not be touched with any Infection, or whether he might not contract the Diſtemper from ſome other cauſe? Now that there could not be any thing of Contagion appears from hence, that the ſame Perſon was of ſuch an undaunted Spirit that he Viſited at other times, ſeveral Perſons that had lay Sick of the ſame Diſtemper, without any prejudice; and therefore the cauſe ſeems rather to be that ſuddain conturbation of his Mind and Spirits, with which he was ſtricken upon the unexpected Sight of this ſame Sick Perſon, and which continually ran in his thoughts; from which Idea ſuch a diſpoſition aroſe in his Body, which at length produced the Small Pox. Now if any man can more clearly unfold how ſuch an Accident ſhould happen, he ſhall be my great *Apollo.*

HISTORY. VII.

A Young Maid of two and twenty Years of Age, full body'd, freſh colour'd, and ſomewhat fat, being ſeized with a mild Fever, beſides extream Heavineſs and ſome ſleight interveneing Deliriums, ſuffered under frequent and ſtrong Epileptic Convulſions, and very terrible ſwooning Fits, ſo that the ſtanders by thought ſhe had been troubled with the Mother, and that ſhe would preſently dye. I being ſent for, when I underſtood that ſhe had had her Monthly Evacuations eight days before, looſened her Belly with a Glyſter, and the ſame day order'd her to be let blood in the Arm; about the Evening I gave her this Sudorific

℞. *Theriac. Androm.* ℥ j. *Harts-horn burnt, Extract of Carduus Benedictus, Salt of the ſame an.* ℈j. *Treacle-water and Carduus-water an.* ℥ j. *Oyl of Amber three drops. Mix them for one draught.*

Having taken this, ſhe ſweat ſoundly that Night with great relief, neither did her ſwooning Fits, nor her Convulſions return: The next day the

the red Spots, fore-runners of the Small Pox began to appear up and down all over her Body. Thereupon we gave her this Decoction to drink.

℞. *Elecampane Root, Licorice ſliced an* ℥ iij. *Barley cleanſed* ℥ j. *Red Vetches* ℥ j. ſ. *Fennel Seed* ℥ij. *Figs* n°. xvj. *Raiſins ſtoned* ℥ j. ſ. *Water* q. ſ. *Make a Decoction to two Pints.*

Upon this the Small Pox broke out very thick; and all the Symptoms preſently ceaſing with the Fever, ſhe was reſtored to her health in four Weeks, and as it were reſcu'd from the Jaws of Death, went abroad again about her buſineſs.

ANNOTATIONS.

IN this Diſeaſe ſuch Epileptic Convulſions and Swoonings are very bad preſages; and unleſs the Small Pox appears very quickly, the greateſt danger is to be feared; for that they may be eaſily the Death of the Patient before the Pox break forth. Nor is it any wonder, in regard this malignant Miſchief grievouſly effects the Heart, as appears by the Fever, the Swoonings, and the heavineſs of the Mind, and therefore greater danger is to be expected, if the Brain the Primary Bowel of Life, be equally afflicted.

HISTORY VIII.

Rutger Schorer a Lad of Fourteen Years of Age, and Eldeſt Son of *Iſaac Schorer* a Lodger of mine, was taken in *September* with a Fever and Small Pox, and had them very thick, when he began to grow well about the fourteenth day, his Brother *Iſaac Schorer* was taken in the ſame manner. When he had lain ſixteen days, his Siſter *Mary Schorer* about Ten Years of Age, fell ſick of the ſame Diſtemper; and when ſhe was pretty well at the fourteenth day, the other and Youngeſt Daughter *Maud Schorer*, had the Small Pox come out very thick upon her. In the mean time, the two Sons that were firſt ſeiz'd, were recovered and went abroad. But when the Youngeſt Siſter *Maud Schorer* had kept her Bed about twenty days, *Rutger Schorer* was taken again with a Fever and the Small Pox, and he being recovered, *Iſaac Schorer* took his Bed again upon the ſame account; and being almoſt cured, *Mary Schorer* was taken a ſecond time, and the third week after *Maud Schorer* was again ſeized as the reſt had been. And as the firſt time the Diſeaſe had deſcended in order from the Eldeſt to the Youngeſt, ſo likewiſe in ſo ſhort a ſpace of time, it obſerved the ſame order a ſecond time; and yet two at once were never ſeiz'd with the Diſeaſe. And which is to be wondered at, all theſe four were ſo little prejudiced by the Diſtemper, that not one of them happened to be diſfigured in the Face either with Pits or Scars, which is in great part to be attributed to the great care which we took in the Cure, in regard we were all of one Family; ſo that we had the opportunity to ſee them every hour.

ANNOTATIONS.

THe Small Pox ſeldom ſeize the ſame Perſon twice or thrice; for that generally upon the firſt ſeizure all that Specific Malignant Contamination, inherent in the Blood and ſeveral Parts, being ſeperated by the Fermentaceous Ebullition, is quite expelled; which Effervеſcency, if it

be not ſtrong enough, then it happens that the Blood is not ſufficiently purify'd from that defilement, and hence that after ſome Years, the Small Pox comes again by reaſon that the Old remainders are by ſome new occaſion provoked to Action. But that the Small Pox ſhould ſeize in ſuch an Order four Children of the ſame Man, and that in ſo ſhort a diſtance of time, and every time come out ſo thick, is that which never before we knew in all our Practiſe. If perchance ſome few had only come forth the firſt time, it might have been probable, that ſome of the Relics of the Contamination not ſufficiently ſeperated through weak Fermentation, might break forth again; but in regard that Conjecture vaniſhes by reaſon of the great quantity coming out over the whole Body, both the firſt and ſecond time, I would fain know to what other cauſe we can attribute ſuch an accident as this, then to ſome occult and unexpreſſible cauſe, that lies no leſs latent in the Small Pox then in the Peſtilence: and how it ſhould come to paſs, that I my ſelf, who am now about ſeventy Years of Age, and was not only converſant with theſe but a Thouſand others, yet never ſhould have the Small Pox, ſince that contagion does ſo eaſily infect others.

HISTORY IX.

A Virgin of Three and Twenty Years of Age, Plethoric and Strong, being taken of a ſuddain with a Fever, accompanied with an extraordinary heavineſs, of her own head took a Dram of Treacle in a little Wine, which cauſing her to Sweat ſoundly, preſently the Small Pox came out very thick over all the Body; but her Fever and heavineſs were ſo far from ſlackning, that they grew more violent. Then my advice, but too late, was asked; for the ſtrength of the Maid was ſo far ſpent, that there was hardly any thing to be given her. However I gave her twice a Dram of Crabs-Eyes, prepared with a little Decoction of Barley, and preſcribed her a pleaſing Julep. But the ſixth day, her Monthly Evacuations came from her, out of the Order of time, and the ſame day the Pox that continued high raiſed till then, ſuck down again; So that the Fever and heavineſs increaſing, the Maid, all her ſtrength failing her, dy'd the next Night.

ANNOTATIONS.

AT the ſame time, two other Young Maids, their Evacuations burſting out unexpectedly, and unſeaſonably, in a ſhort time dy'd. And this has been obſerved by us ſeveral times in this diſeaſe, when there is a violent Ebullition of the Blood, and that the Small Pox come out thick, without any Diminution of the Fever and Symptoms, then it is a very bad if not a mortal Sign; if the Monthly Evacuations break forth out of Seaſon. For ſuch Patients ſeldom or never eſcape, though that Eruption happens upon the Seventh or any other Critical day. Moreover we have obſerved this, that if during the Ebullition of the Blood in the Small Pox, the Monthly Evacuations alſo break forth, at the uſual Period of time, ſuch Patients are then alſo in great danger, and many of them dye, though ſome eaſe might be expected from ſuch an Evacuation.

HISTORY X.

ANN of *Durenburch*, a Young Maid of Twenty Years of Age, was taken with a Fever and Heavineſs, accompanied with a Doſineſs of the Head, and an inclination to ſleep, and oft-times a ſlight interveneing Delirium, affrightment in her ſleep, and a moderate Thirſt. Having taken a Diaphoretic, and Sweat ſoundly, ſoon after the Small Pox

Pox appeared. Afterwards ſhe drank of this Decoction four, five, or ſix times a day.

℞. *Barley cleanſed* ℥ ſ. *Root of Elacampane* ℥ v. *ſliced Licorice* ℥ij. *Orange-peels* ℥iij. *Scabious a handful and a half, Fennel ſeed* ℥j. *four greater Cold ſeeds an.* ℈iiij. *Fat Figs* n°. xv. *Raiſins ſtoned* ℥ j. ſ. *Water* q. ſ. *for an Apozem of two Pints.*

When the Small Pox were now ſufficiently expelled by the uſe of this Decoction, I ordered that her face ſhould be often fomented with a ſoft Spunge dipped in lukewarm Mutton Broth: but becauſe it fell out that the Broth could not be had, and ſhe was importunate for ſome Topic to preſerve her Face, I ordered her Face to be anointed twice a day, with old Oyl of Turneps, which done the Pox in her Face were not ſo big as thoſe over the reſt of her Body, they ripened alſo ſooner, and the Scabs at length falling off, no Pits at all remained in her Face: Only the Oyntment was continued till ſhe was perfectly cured.

ANNOTATIONS.

IF the Small Pox are not large and Contiguous, for the moſt part we adminiſter nothing to prevent Piting, but leave Nature to do her own buſineſs, in regard ſhe does it better of her own accord then the Phyſitians can do by Art, ſo that the Patients themſelves do not dig off the Scabs with their Nails, but ſuffer them to dry and fall off of their own accord. This daily Experience tells us: For that Thouſands are better Cured without Pits or Marks left behind, to whom no Topics are adminiſter'd: and many to whom Topics have been adminiſter'd without Judgment, have had deeper Pits, then if they had left the Work to Nature without Topics. But if the Pox are very large and Contiguous in the Face, or if they be ſuch Patients that will not be ſatisfy'd, unleſs the Phyſitian aſcribe them Topics, which is frequent among Young Ladys that are afraid of their Beauty; then ſuch things are to be preſcrib'd, as mollifie the Scabs of the Puſtles, and bring the matter therein contain'd to quickeſt Maturation. To that purpoſe I have frequently preſcribed the Oyl of Turneps with good ſucceſs; by which means very few or no Footſteps of the Small Pox have been ſeen; which was once imparted to me as a great Secret by on *Harſcamp*, a Famous Practitioner. *Foreſtus* anoints the Scabs with Oyl of Sweet Almonds till they are dryed up, which prevents, as he ſays, all Piting and Scars, and ſo highly approves that remedy, that he cannot think of any better, as being that which has no Smell, and is no way noiſom either to Children or grown People. However great care is to be taken of making uſe of dryers at the Beginning; for theſe prevent the farther Maturation of the matter, and by drying up the Scabs and Pits, hinder the Generation of new Fleſh; of which Errour committed, *Foreſtus* gives us a terrible Example. *For*, ſays he, *when a Young Gentleman of Thirty Years of Age, having had the Small Pox, by the advice of his Nurſe made uſe of Butter Fryed to Blackneſs in a Frying-Pan, and beſmeared all his Face over with it, the Scab became ſo very naſty, exulcerating all his Face, that he loſt one of his Eyes, and but for the application of timely remedies, had loſt the other too. And therefore it is that we ſo often inculcate, that many People ſcape better that uſe no applications at all; ſo that whatever Authors write that Maturing Medicines are to be applyed, I ſay, it is to be done with great Caution.*

HISTORY XI.

A Noble Lady of Eighteeen Years of Age, finding her ſelf not well, ordered me to be ſent for: She had a ſlight Fever and complained of Melancholly at her Heart (which cauſed her frequent-

ly to ſigh) and heavineſs of her Head, with an inclination to ſleep. Now in regard the Small Pox was then very rife, I had preſently a ſuſpition of her Diſtemper. Thereupon when ſhe told me that ſhe had been at Stool that day, and that it was a good while before her Monthly Period would be up, preſently I let her Blood in the Arm, and took away eight Ounces of Blood; for ſhe was Plethoric: after which ſhe found her ſelf as ſhe ſaid ſomewhat better. Ten hours after Blood-letting, certain red Spots began to appear upon her Breaſts and Hands, but few and ſmall: Thereupon about the Evening I preſcribed her this Diaphoretic

℞. *Treacle of Andromachus, Diaſcordium of Fracaſtorius an.* ℥ ſ. *Salt of Wormwood, Confection of Hyacinth an.* ℈ j. *Treacle-water, and Water of Carduus Benedict. an.* ℥ j. *Mix them for a draught.*

When this had cauſed her to Sweat moderately all Night, the next day the Puſtles came forth higher, and the Fever together with the anxiety vaniſhed altogether: Thereupon we gave her a Decoction of Figs in Ale to drink; and thus in a few days ſhe reovered with theſe few Remedies, not having had above three or four in her Face, and very few upon the reſt of her Body.

ANNOTATIONS.

WHat is to be thought of Blood-letting in this Diſeaſe and when it is to be made uſe of, we have ſufficiently Explained. *cap.* 8. And I have particularly obſerved, that if in Plethorics it be timely made uſe of, before any Eruption of the Small Pox, then it comes forth more eaſily and not ſo thick, and the Patient recovers ſooner. And therefore when you meet with Young Girls that are nice of their Beauty, I think it very beneficial to let Blood in time, ſeeing that then fewer and leſſer Pox come out in the Face: But becauſe the Phyſitian is ſeldom ſent for till the Pox begin to come forth, hence it is that Blood-letting cannot be made uſe of.

HISTORY XII.

A Little Son of *Nicholas ab Harvelt*, began to grow ill in *Auguſt*; but in regard that I was ſent for at the beginning, and had preſently a ſuſpicion of the Small Pox; I gave him a little Treacle-water, with a little Bezoar-ſtone and Saffron (for the Child was not above three Years old, and other ungrateful Taſtes would not have gone down:) and to preſerve his Eyes, I ordered his Eye-lids to be anointed with Saffron mixed with Womans Milk. The Aunt who had the care of the Child, in my abſence mixes a greater quantity then is uſual with the Milk, and not only anointed his Eyes but all his Face twice a day. Which caus'd a ſtrange Diſfigurement of the Child, whoſe Face was all over yellow with the Saffron: In the mean while the Child ſweat very well, and ſtill took now and then three ſpoonfuls of Treacle-water, which preſerved him in a moderate heat, and drank for his drink the ſimple Decoction of Figs. The next day ſome very ſmall Spots began to appear here and there upon his Skin; but the third day the Small Pox came out very thick over all his Body, except his Face; where none at all, nor the leaſt ſign of any were to be ſeen; yet the Child was never the worſe in regard they came out ſo thick over all the reſt of his Body.

Body. The Fever then went off, and ſo the Child was perfectly recovered, without having his Face ſo much as touched.

ANNOTATIONS.

The Saffron gently aſtringent repels and drys, but whether being outwardly applied it hinders the coming out of the Pox; or whether through any other Specific and occult quality it has that effect, I am uncertain, and much queſtion. But we ſaw the effect of it not only in this Child, but alſo in three or four more: For the Childs Aunt, when ſhe had told what had happened up and down to other Women, there were ſeveral that would needs try the Experiment with the ſame good ſucceſs. And whether it will have the ſame ſucceſs always at other times, when occaſion offers we ſhall try our ſelves?

HISTORY XIII.

THE moſt Noble the Lady *Lucas*, an Engliſh Woman, bred up in her Houſe a Young Lady, her Brothers daughter, about ſix or ſeven Years of Age: So ſoon as ſhe began to be Fevouriſh, anxious and droſie, by my advice ſhe had given her a little Powder *Liberans*, Harts-horn burnt, Bezoar-ſtone and Saffron, with an ounce of Treacle-water, which cauſed her to Sweat well with ſome eaſe. For her drink, ſhe drank the Decoction of raw Harts-horn, as it is prepared for Gellies, and frequently the ſimple Decoction of Figs: In the mean time the Lady *Lucas*, every day twice or thrice waſhed the Face of our Patient with that ſame ſort of Cinnamon-water which our Apothecaries generally ſell, which is made of Cinnamon diſtilled in Borrage-water, and diligently kept the Young Lady in a continual breathing heat. The ſecond day toward Evening the red Spots began to appear, the third day the Small Pox came out very thick, every where except upon her Face, where there was not one to be ſeen: So that the Lady continued the Lotion of the Childs face for ſome days. In the mean while the Fever going off, our Patient was perfectly cured, without the leaſt Sign of the Small Pox upon her Face.

ANNOTATIONS.

THe ſame Lady gave the ſame advice alſo to the Lady *Couper*, who having waſhed the Faces of three of her Children that lay Sick of the Small Pox with Cinnamon-water, not one of them had any Sign of them in their Faces. Whether the ſame ſucceſs will always attend upon others, will be manifeſt by the frequent Tryal upon others. In the mean time it is to be conſidered, whether upon hindering the Small Pox from breaking out in the Face, there may not be ſome danger leaſt the Menixe's and Brain ſhould receive ſome prejudice.

HISTORY XIV.

THE Lady *Ruchabor*, about twenty four Years of Age, ſo Beautiful, that ſhe was the Admiration of many, in the Month of *Auguſt* was taken with a Fever and the Small Pox, ſo that her Head was wonderfully ſwell'd; when ſhe had made uſe of ſeveral Remedies by my Advice, and the Small Pox came out very thick over all her Body, and had pepper'd her Face, at length after the Fever went off, and that the Swelling of her Head was quite fallen, I ordered her Face to be frequently fomented with Mutton Broth.

But

But ſhe not contented with that, to preſerve her Beauty, by the advice of ſome Ignorant Women, cauſed the ripe Puſtles to be opened with a Golden Needle, and the Matter to be ſqueezed out; but mark the Event, ſhe that perſwaded her ſelf, ſhe ſhould have no Pits, when ſhe recovered, had her Face ſo disfigured with Scars and Pits, that of one that was moſt Beautiful ſhe became very deformed, and a Thouſand times bewayl'd that Fooliſh act of pricking the Wheals.

ANNOTATIONS.

THo many Phyſitians to preſerve the Face from Scars and Pits, order the ripe Wheals to be prick't with a Golden Needle, yet we have found a Thouſand times by Experience, that it occaſions the leaving of ſeveral Pits, and that it is far more conducing to the Cure not to touch them either with Needle or Hand. Hence *Senertus*, *The ſafeſt way*, ſays he, *when the matter appears white and conſequently Concocted, is to commit the whole management to Nature, ſince Experience teaches us, that where the Pox dry up and open of themſelves, thoſe People ſcape with leſs Diſfigurement, and leſs Footſteps of the Diſeaſe.*

But how dangerous it is to make uſe of the hands, and Topics, *Foreſtus* tells us, by the Example of a Young Maid. *When the Diſtemper* ſays he, *was going off*, and I was deſired to preſcribe drying Liniments to the Face, I adviſed the Patient to forbear them and commit the whole Cure to Nature, when a white Concocted Matter ran out of the broken Pox, and I ordered her not to touch the Scabs with her Fingers, though they Itched never ſo much. But becauſe ſhe could forbear Scratching the Wheals, ſome of which were not yet ripe, and by the advice of Idle Women made uſe of Fat and Cream to dry them up, her Face was overcaſt with a deformed Scab, and the Scars remained; beſides a Redneſs aroſe in her Eyes, that could never be cured, but continued as long as ſhe lived.

HISTORY XV.

A Noble Young Lady about twenty Years of Age, having ſat a while with her dear Companions that lay Sick of the Small Pox ſeemed to have received ſome Infection from it: That very Evening her Head grew heavy, and ſhe loſt her Stomach which was accompanied with a ſlothful wearineſs of the whole Body. The next day ſhe grew Feveriſh: upon which I foretold her, ſhe muſt expect the Small Pox: Thereupon I gave her a Sudorific Draught, and ordered her to be kept in a gentle Breathing Sweat all the next Night. The third day in the Morning I found her well covered over all the reſt of her Body, only her Legs out of the Bed, and her Feet up to the Ankles in a Veſſel of warm Milk. This ſhe had by the Advice of the ſilly Women, who had perſwaded her that if ſhe bathed her Feet in warm Milk ſhe would have no Pox in her Face: So that ſhe continued in that Milky Bath all the day till the Evening. In the mean time the Small Pox came out that very day, but no where ſo thick as in the Face; and ſo the Invention of Bathing the Feet in Milk was found to be uſeleſs: However in other things the Patient followed my Advice, and being well Cured, without many Pits in her Face, laught many times afterwards at the ſilly Milky Counſel that was given her.

ANNOT.

ANNOTATIONS.

THis Patient had good Luck that her Bathing did her no more harm, for though she were well cover'd, yet by that Ventillation some Cold might easily have got to her, and have done her much Injury; I remember afterward I saw the same Bath made use of in the Court of the *Baron* of *Brederode* to a young Lady that then lay sick of the Small Pox; but still with the same Success: So that this Bathing in Milk lost all its Reputation in that Court, though it never had any with me, notwithstanding that I have heard it commended by several Women.

HISTORY XVI.

IN *October* two Sons of *N. Romburch* a Vintner, were taken with a Fever. The next day the Parents gave to each half a dram of Treacle, which caused a moderate Sweat; and for Drink they gave them the simple Decoction of Figs in small Ale. The third day some Red Spots appeared; and afterwards the Small Pox came out very thick over the whole Body and many also seized the Eye-lids. Then my Advice was desired. Now because the Children were Indifferent well, proportionably to the time of the Disease, I did not think it necessary to prescribe any Physic, only I ordered the Parents, to wash the Eye-lids three or four times a day with a soft Spunge dipt in a Decoction of Althea, Flowers of Melilot, Roses and Fenigreek, and to open the Eye-lids with their Fingers once or twice a day, to let out the Humour gathered underneath. But the Parents neglected that Advice, foolishly tender, and fearing to hurt their Children by handling their Eylids. Upon the fourteenth day the Pox being ripe, the Swelling of the Eye-lids fell, and the Eyes open'd; but it was observed that both the Boys were perfectly Blind, and that there was a Skin grown over the Sight and the Iris, which Skin was generated out of the Humour, so many days detained within the Eye, and became viscous, and now covered the whole Eye like a veil. This unexpected accident greived the Parents; thereupon I prescribed the following Powder.

℞. *The whitest Sugar-Candy* ℥ij. *Lapis Calaminaris* ℈j. *make a very fine Powder.*

This I caused to be blown into their Eyes through a hollow Quill: and the slight pain which it caused, quickning the motion of the Eye-lids, those little Films were in a short time rubbed off, and washed away, by the Tears that dropt from the Eye; by which means the Boys were cured of that Impediment.

ANNOTATIONS.

THis we have often happen'd to see in Practice, that by reason of the Eye-lids being swell'd and shut up by the Small Pox, littles Films have grown in the Eyes, but we have easily rubb'd them off with this Powder, because they only stick to the outside of the Sight of the Eye; if it be presently us'd at the beginning, when the swelling falls, and the Eyes begin to open; but if you stay till they are dry'd and hardned by the External Air, then they will not easily give way to so slight a Remedy, but sharp Medicines must be us'd; and the mischief is to be remov'd with more trouble and pain. Two things are therefore

ſore to obſerv'd. 1. That the ſwell'd Eye-lids, let the Patient be never ſo unwilling, muſt be parted one from the other with the Fingers; and free Egreſs given to the Liquor contained in the Eye. 2. That if thoſe Films are grown, that their Cure be not delayed, but that care be immediately taken to remove them before they are harden'd by the external Air.

HISTORY XVII.

BEing ſent for together with a Chyrurgeon to the Village of *Bemmel* to ſee a Country Man that was wounded in the Breaſt, by accident we found a Boy in the ſame Houſe that was taken with a Fever and under great Anxiety; and therefore becauſe we had no other Remedies at hand, we perſwaded the Man to get an ounce of new Sheep's dung, and ſteep it three hours in ſmall Ale, and then Straining it give it Blood-warm to the Boy and cover him up cloſe. The next day I went again, and found that the Boy had Sweat very well after his Draught; and when I look'd nearer upon him I perceived that the Meaſles were come out very thick upon him, upon which the Fever was almoſt gone off with a great part of his heavineſs. I ordered them to keep him in a Breathing Sweat for three or four days, and to be ſure not to let him take Cold.

ANNOTATIONS.

I Expected this Body ſhould have had the Small Pox, but the Meaſles came forth, of which the firſt Cure is the ſame with the Small Pox. New Sheeps-dung with equal Efficacy expels both the one and the other, and therefore in both caſes is very advantageouſly adminiſter'd, eſpecially in thoſe places where other things are not to be had, ſome there are who prefer Horſe-dung adminiſter'd after the ſame manner, before it. But that Sheeps-dung is much more prevalent, the Savour tells, in which we find there is much more Salt of Niter or ſome more ſpecific Diaphoretic Salt.

HISTORY XVIII.

A Young Man of twenty four Years of Age, ſtrong and Plethoric after his violent Exerciſes of Tennis, and Fencing, and hard drinking of Wine between while, fell into a violent Fever, accompany'd with great thirſt, dryneſs of the Mouth, and extream Anxiety and reſtleſſneſs, with other very bad Symptoms. This Young Man we order'd firſt to be let Blood and then preſcribed him a Gliſter, together with Julips, cooling Apozems and Electuarys to quench his thirſt. The third day he was Purged with an Infuſion of Senna-Leaves and Rhubarb mixt with Electuary *Diaprunum*; which gave him ſix Stools, but the heat remaining together with the Fever, he was let Blood again the fourth day. The fifth day he continued the uſe of his Julips, Apozems and cooling Electuary. The Night ſucceeding the ſixth day he was ſo very heavy and drowſie, that there was little hopes of his Life, and we thought he would have dyed. The ſeventh day the Meaſles came out all over his Body by way of Criſis. Then the Fever and all the preſſing Symptoms ſomewhat remitted, ſo that the Patient ſlept a little the next Night: but by the two next days both Fever and Symptoms were quite gone off by degrees. The tenth day the Meaſles began to leſſen, and upon the twelfth quite vaniſhed. And thus the Patient who ſeemed to be at Deaths Dore, contrary

trary to the Expectation of many was restored to his former Health.

ANNOTATIONS.

THE beginning of the Disease was such, that no Man could well have any suspition of the Measles; and therefore the Patient was dealt with by us, as labouring under a Burning Fever; which Fever at length you see, ended nevertheless in a Critical Evacuation of the Measles.

HISTORY. XIX.

A Strong Young Man was seized by a Violent Fever accompany'd with a thick, weak and unequal Pulse, an Extream Anxiety, heavy Pain his Head, drowsiness, restless sleep, and a slight kind of Delirium. I would willingly have let him Blood, but because he would not permit me, I gave him the following Sudorific toward the Evening.

℞. *Treacle* ℈ij. *Diascordium of Fracastorius* ℈j. ſ. *Confectio Alkermes, Extract of Carduus Benedictus, Salt of Wormwood an.* ℈j. *of our Treacle Water, Carduus Water an* ʒj. *mix them for a Draught.*

Though upon this he Sweat very well, yet finding the Disease to continue in the same State: the next day he took the same Sudorific again, and Sweat very well; but then the red Spots that fore-run the Small Pox began to appear up and down in the Skin. Nevertheless the Fever and other Symptoms seemed to be somewhat abated, yet did not go off: Therefore I ordered the Patient to be kept in a gentle breathing heat, and that he should take a Draught of the following Decoction luke-warm several times a day.

℞. *Red Vetches* ʒj. ſ. *Barley cleansed* ʒj. *Scabious one handful* ſ. *fat Figgs n°. XVI. Raisins Stoned,* ʒij. *Water.* q.ſ. *make a Decoction to two Pints.*

By this means the Small Pox came forth every where very thick, and rose very high, the Fever and Anxiety still continuing; so that the Patient seemed to be in great danger of his Life: For which reason I thought it necessary to give him the former Sudorific again; puting him into somewhat a greater Sweat, and the Decoction of Figgs being continued over and above for two days, the seventh day, contrary to all expectation, the Measles came out over the whole Body between the Small Pox, and then the Fever and other Symptoms abated very much; and by degrees went off, all together, and the Patient being happily recovered the fourth week from the beginning of the Disease, went abroad again.

ANNOTATIONS.

I Do not remember that ever I saw this Accident above twice or thrice in all my Practice; that is to say that the Small Pox and Measles should come both together. However by this Observation it appears, that although both these Diseases in respect of Infection have somewhat in common, yet in re-

ſpect of the Subject to which that Infection adheres, there is ſomething of difference and diſtinction between them. Otherwiſe what ſhould be the reaſon that in this Patient, the whole Infection ſhould not be Evacuated with the Expulſion of the Small Pox? Then again it is to be admir'd that why the Meaſles, adhering to the more ſuttle and thinner Matter, did not break out firſt, ſeeing that the thinner Matter is quicker in coming forth than the thicker.

HISTORY. XX.

A Noble *Batavian*, was ſeized by a Fever, accompany'd with a ſtrong Pulſe but very unequal, an extream Anxiety, Thirſt, reſtleſſneſs, a ſlight Delirium, and ſome little convulſive Motions of the Extream Parts. Having looſned his Belly with a Gliſter, I ordered him to be let Blood. Toward Evening having taken a Sudorific he Sweat very much, but the Diſeaſe remaining in the ſame State, the next day the Sudorific was repeated, he Sweat very well. All this while the Symptoms nothing abated, but the Patient began to complain of a Pricking in his Skin quite all over his Body. Soon after it was obſerved that great red Spots appeared in his Skin, ſome as broad as a Dollar, ſome half a Hands breath, ſome more, ſome leſs, which ſeemed to be all fiery, ſown all over with little riſings like Millet Seeds. Theſe Spots in a days time cloſed all together, and ſpread themſelves all over the Body. So that it was all over of a red florid Colour. In the mean time the Fever and Symptoms abated. Three days after, that general redneſs abated alſo, and the Spots returned to be as they were when they firſt appeared, and ſo within three days vaniſhed quite away, and ſo the Patient, after the Skin of his Body was all peeled off, was reſtored to perfect Health.

ANNOTATIONS.

THis Diſtemper, which *Foreſtus* calls *Purpuræ*, or the Purples is very near akin to the Meaſles, and the Cure of both is almoſt the ſame; only the Subject to which this Infection adheres is hotter then that of the Meaſles; but it is as eaſily diſſipated; nor are thoſe little Puſtles ſuppurated, but diſſipated by heat.

The

MEDICINAL OBSERVATIONS AND CURES OF Isbrand de Diemerbroeck.

OBSERVATION. I.

An Inflammation of the Lungs.

Monſieur La Fontaine, a Noble French Man, about thirty Years of Age Plethoric, no great Drinker, yet a Lover of unmixed Wine, upon the Tenth of *November*, going to Bed, began to complain of difficulty of breathing, yet without any pain in his Breaſt: ſoon after a redneſs ſeized his Face, eſpecially his Cheeks, and his Eyes alſo appeared ſwelled and inflamed. This difficulty of breathing, within two hours was ſo encreaſed, that he could hardly draw his Breath; infomuch that he was afraid of a Suffocation. Wherefore about Midnight he ſent for me, bidding the Meſſenger tell me withal that he ſhould dye, unleſs I could help him with ſome preſent Remedy. By the redneſs of his Face, and his little frothy and flowry ſpitting, as alſo by his difficulty of Breathing, which was without any pain, yet with a kind of heavineſs in his Breaſt, I judged this Diſtemper to be an Inflammation in his Lungs, ſo much the rather becauſe I found by his Pulſe, that he was in a ſtrong Fever. Thereupon I ordered a pint of Blood to be taken from the Baſilic Vein of his right Arm: by which he felt very much eaſe. To drink (for he was very thirſty) I gave him a *Ptiſan* of Barly cleanſed, and Licorice boyl'd in Water. In the mean time the following Gliſter was prepared, and given by ſix a Clock the next Morning.

℞. *Emollient Decoction* ℥x. *Elect. Diacatholici Diaphœnici an.* ℥j. *common Salt* ℥j. *Oyl of Violets* ℥ij. *for a Gliſter.*

This gave him two ſufficient Stools: But becauſe the difficulty of breathing ſtill continued very oppreſſive, about ten a Clock we took away a pint of Blood out of his left Arm. The Blood appeared indifferent good, only that it had a great deal of Yellowiſh froth at the top. Then beſides the *Ptiſan*, he drank of the following *Apozem* now and then every day.

℞. *Barley cleanſed* ℥vj. *ſliced Licorice* ℥j. *ſ. Endive Sorrel, an. one handful, Violet Leaves two handfuls, Flowers of Poppy Rheas two little handfuls, the four greater Cold-ſeeds, and Lettice-ſeeds an.* ℥ij. *Currants* ℥ij. *Common-water* q.ſ. *Boyl this according to Art to two Pints. In the ſtraining diſſolve Syrup of Poppy Rheas, Violets and Limons an.* ℥j. *mix them for an Apozem.*

For his nouriſhment I preſcribed him Broths with Chervil, Endive, clenſed Barley and the like boiled therein. The next day becauſe the Patient would admit no more Gliſters, I gave him a Laxative Medicin, which gave him four ſtools with great eaſe. In the mean time he breathed much more freely, and his Fever very much abated. The following days, the foreſaid Apozem was five times repeated, the ſeventh day of the Diſeaſe, he fell into a very great Sweat of his own accord; and ſo the force of the Diſeaſe being broken by a *Criſis*; the Fever, with the difficulty of breathing went off, and the Patient was reſtored to his former Health.

ANNOTATIONS.

SAys *Gallen*, *when an acute Fever happens with difficulty of breathing, accompanied with ſtreightneſs and heavineſs, that Diſtemper is an Inflammation of the Lungs.* Now this Inflammation ſometimes happens of it ſelf, ſometimes it ſucceeds a Squinancy, or Pleuriſie, when a Humor is carry'd from the Chaps or ſide into the Lungs by way of Mutation. Whence *Hippocrates*, *An Inflammation in the Lungs from a Diſtemper in the ſides, is bad.* For it is a dangerous thing for one acute Diſeaſe to accompany or follow another. But an Inflammation of the Lungs that does not proceed from any other Diſtemper, but grows of it ſelf, proceeds from a thin and Choleric Blood flowing in a greater quantity then can be circulated into the Subſtance of the Lungs, and there inflamed. This Inflammation of the Lungs *Fernelius* aſſerts to be the leſs frequent of the two. And it is much leſs frequent then the Pleuriſie, from which it differs, becauſe the one ſeizes with a moſt acute pain, the other with a little pain, but an oppreſſing heavineſs; for that the one inflames and diſtends the Pleura Membrane, which is endued with an Exquiſite Sence; the other inflames and dilates the Lungs, which are nothing ſo Senſitive. In other things, as acuteneſs of the Fever, difficulty of breathing and other ſigns, as alſo in the Cauſe and Cure of the Diſeaſe they both agree. But beſides the foreſaid Inflmamation of the Lungs, there is another ſort more frequent which differs very much from the other in the exceſs of the Symptoms and the Cauſe, as ariſing either from Flegm collected and putrified in the Lungs; or from a thin, ſharp, and copious diſtillation falling down upon the Lungs from the Brain, and there preternaturally glowing and cauſing a Fever, and by degrees waſting the Patient with a Cough, difficulty of Breathing and a ſlow Fever, without any ſpitting of Blood.

An Inflammation of the Lungs therefore is an acute Diſtemper, which, as *Celſus* teſtifies, is more dangerous than painful.

Now this Diſtemper does not always ſeize the whole Lungs, but ſometimes one particular Lobe, which *Jacotius* teſtifies he has ſeen in the opening of a Peripneumonic Body. So ſays *Joubert* alſo. In a Peripneumony, there is no neceſſity that the whole Lungs ſhould be always enflamed, but many times ſome one of the Lobes only ſuffers, as we have found by the Diſſection of an Infinite number of Bodies. This *Hippocrates*, plainly

plainly declares where he teaches us how to know the differences of this Diſtemper in theſe words. *In an Inflammation of the Lungs, if the whole Tongue be white and rough, both parts of the Lungs are vext with an Inflammation; but where but half the Tongue is ſo effected, on that ſide where it is diſcoloured and rough, there the Inflammation lyes. A pain under one Clavicle, denotes an Inflammation of one of the upper Wings of the Lungs; but the pain extending under both Clavicles denotes that both the upper Wings of the Lungs are inflamed; if the pain lye in the middle of the Ribs, the middle part of the Lungs ſuffers; but if the pain comes to that part to which the Lungs extends it ſelf, the lower wing of the Lungs is effected.* Where one whole Part is affected, there all that anſwer to that Part muſt of neceſſity ſuffer.

The moſt certain and proper ſign, beſides others, of a true *Peripneumony*, is a redneſs of the Jaws (according to the Teſtimony of *Galen*, *Paulus Ægineta* and *Avicen*) with an acute Fever, and extream difficulty of Breathing, if accompanied with none or very little oppreſſive pain. All which, when they appeared ſo manifeſtly in our Patient, there was no queſtion to be made of the Diſtemper; which Diſeaſe went off the ſeventh day upon an extraordinary ſpontaneous Sweat: which *Foreſtus* obſerves to be cuſtomary in a true Peripneumony. Though ſometimes as *Ætius* tiſtifies, in young People it uſes to go off with a violent Bleeding at the Noſe or Flux of the Monthly Evacuations; which nevertheleſs I find that *Riolanus* denies.

Gregory Horſtius has obſerved, that a *Peripneumony* has gone off the ſeventh day with a Critical Flux. Which however ſeems to be contrary to Reaſon, when a Flux of the Belly, according to *Hippocrates*, is very prejudicial to this Diſeaſe, as being that by which the Morbific matter contained in the Breaſt cannot be evacuated, there being no Paſſage from the Bowels included in the Breaſt to the Inteſtines. It may be ſaid that Nature ſeeks occult ways for her ſelf unknown to us, by which ſhe Evacuates that filth which is noxious and troubleſom to her, as when in an *Empyema*, the Matter in the Breaſt is voided by Urine; which ſhe may alſo do in a *Peripneumony*, and ſo the Matter in the Lungs may be conveighed to the Guts, but this rarely falls out.

The Cure of this Diſeaſe is very like the Pleuriſie; for in this Cure Blood-letting has always the greateſt ſhare, many times repeated according to the ſtrength of the Patient, and prevalency of the Diſtemper, uſing at the ſame time aſſwaging Remedies or Glyſters, and other Medicaments, as well to expectorate, as extinguiſh the heat of the Fever. But there is no delay to be made in the Cure; for unleſs this Diſeaſe be oppoſed with all ſpeed, in a ſhort time it either ſuffocates the Patient, or turns into an Empyema or Conſumption, for it corrups the ſubſtance of the Lungs. Thus *Jacotius* reports, that upon opening the Body of a *Peripneumony* he found the upper Part of the Lungs gangreen'd; and the *Medraſtinum* full of a bloody *Serum*.

OBSRVATION. II.

The Tooth-ach.

THE Daughter of *N.* complained of an Intollerable pain in her Teeth, which had laſted for ſome Months together, nor could be aſſwaged by any Topics or other Medicaments taken. I adviſed her for ſome Nights together, when ſhe went to Bed, to ſwallow two Pills of Tranſparent Aloes, about the bigneſs of a Pea, and not to drink any thing afterwards; which when ſhe had done three or four times, the pain ceaſed and never returned.

ANNOTATIONS.

IT ſo happens that ſometimes the upper Orifice of the Stomac being ſtuft with Viſcous, Cold or Choloric Humors is the Cauſe of the Tooth-ach; partly, becauſe of the great conſent there is between it and the Brain, by the Nerve of the Sixth Conjugation; partly, becauſe that then being looſened with

with over much moiſture, it ſends up many Crude and Cold, or Choleric and ſharp vapours to the Brain. In ſuch a Caſe, thoſe Cold and Viſcous Choloric Humors are beſt expelled by ſtrong Vomits or Bitter deterſive Medicaments, that will adhere long to the place affected. And therefore I ordered her toward the Evening to ſwallow two dry Pills of Aloes; ſometime after ſhe had Supped, and to drink nothing after them, to the end that ſtaying in the *Oeſophagus*, and being there melted, they might ſtick the longer to the Orifice of the Stomac, and have more time to cleanſe it. For Medicaments that are taken upon a faſting Stomac, preſently ſink down to the bottom of the Stomac, and ſignifie nothing in the Diſtempers of the upper Orifice. Thus *Avicen* orders all Pills that Purge the Head to be taken at Night an hour after Supper.

OBSERVATION. III.

A Peſtilential Fever.

A French Merchant came to an Inn; and not finding himſelf very well, preſently went to Bed, believing it to be nothing elſe but the wearineſs of his journey; the next day the Diſeaſe augmenting, the Woman of the Houſe deſired me to ſee him, and try whether he were not infected with the Sickneſs which was very rife in many Places. He was very weak with a little Pulſe thick and unequal. Yet the Fever did not offend ſo much by it's heat as by it's malignity. I underſtood alſo by the Sick Perſon, that he found himſelf ill the day before he came, and that this was the third day of the Diſeaſe. But when I found neither Carbuncles, nor Bubos, nor any other Signs of the Peſtilence; I Judged his Diſeaſe to be rather a Peſtilential Fever, then the Peſtilence it ſelf; thereupon I began with Blood-letting, after I had firſt given him a Gliſter, and took away fifteen or ſixteen Ounces of Blood out of the Median Vein of the Right Arm, which Blood (a thing to be wondered at) was for the moſt part whitiſh; ſo that it hardly ſeemed to be Blood: When it was cold, that which firſt came out, firſt like Milk, was all coagulated like a Muſcilage, and was of a greeniſh Colour, only ſome very few red Clods were to be ſeen at the bottom: That which flowed out laſt, was for the moſt part between green and white, but at the bottom there was a Setling of Blood of a dark red Colour, that was ſcarcely curdl'd. This Blood-letting gave him great eaſe. In the mean while for his Drink I gave him a Ptiſan, wherein Citron Rinds and the Fruit of Tamarinds were boyl'd. Then, becauſe of the extraordinary Corruption of his Blood I ordered him to be let Blood again, which the Patient hearing, impatient of the Anxiety that oppreſſed him, he earneſtly deſired me it might be done that day. Thereupon toward the Evening we took out of his other Arm about a Pint of Blood, that which came out firſt was very white, that which came out laſt very red: and to repair his ſtrength we gave him Chicken Broth with Sorrel and a Pome Citron boil'd in it. All the next Night he was very penſive, weak and reſtleſs, ſo that it was thought he would have dyed. But Nature, being now diſcharged of her burthen, the next day which was the fourth day of the Diſeaſe, ſtrongly and ſucceſsfully expelled the remainder of the Malignity, by a critical and ſpontaneous Sweat, which about Noon breathed out in great abundance from the Patients Body: at the ſame time alſo ſmall red Puſtles, like Millet Seeds, came forth very thick, ſo that the Skin of his whole Body was cover'd with them from Head to Foot. After this lucky Criſis the Fever went off, and then the Patient falling again to his Broths, and Drinking his Ptiſan,

Ptiſan, recovered his former Health and loſt Strength. But all the Cuticle of his Body became new; the former peeling off not without an extraordinary Itching.

ANNOTATIONS.

CErtainly it was a very great Malignity that had caus'd ſuch a Corruption of Humors, by which the Blood was ſo ſtrangely changed in ſo ſhort a time, as to looſe its Natural Colour and grow white. 'Tis true I once ſaw at *Beauvais* Blood which came out at firſt white like Milk, and afterwards ſomwhat red from the Arm of one that was Sick of a Malignant Fever; which Blood was then ſhew'd to ſeveral that lookt upon it with admiration. Theſe Malignant Fevers too, were at that time very rife in moſt Parts of *France*, and were caus'd by the common and great Infection of the Air. The Nature and Cure of which ſee *Obſ.* 24. where we ſhall deſcribe the Story of a Fever like to this that ſeiz'd one of our Country Men.

OBSERVATION IV.

John de Laurier, a Merchant of *Poitou*, about threeſcore Years of Age, ask'd my advice concerning a *Gonorrhea*, which he had for ſome Months, accompanied with a heavy pain in the Loyns. Upon Examination of the caſe, I found by many Signs that there was no Virulency, but only a Miſcheif contracted by the more violent uſe of Venery, which had weakened the ſeminary Veſſels. Wherefore I preſcribed him a diet moderately heating and drying, meats of good juice and quick nouriſhment, to drink unmixed Wine moderately and to take ſome other corroborating and nouriſhing things. Then after I had purged his Body twice with a gentle Purge, that the Viſcous humours might be firſt expelled the ſeminary Veſſels, before the uſe of other Medicaments, every Morning and about five a Clock in the Afternoon, I gave him ℈ij. ſ. of Salt Prunella in a Draught of red Wine; which when he had taken for eight days together, he was perfectly Cured, without having need of any more remedies, which I had ordered him to uſe. All this while I ordered his Loyns to be anointed with the following Oyntment.

℞. *Martiat Oyntment* ℥ij. *Oyl of Foxes* ℥ ſ. *Oyl of Turpentine* ℥ij. *Oyl of ſqueezed Nut-megs* ℥j. *make an Oyntment.* 3

ANNOTATIONS.

A Gonorrhea according to *Galen*, *Ætius* and others, is an unvoluntary Excretion of the Seed; of which ſome make two, others three, we four differences.

Firſt, by reaſon of the heat of the Reins, and plenty of Seed, and this is called *Pollution*. It happens with ſome Pleaſure and Erection wherein it differs from other *Gonorrheas*, becauſe they are accompanied with neither. It is cur'd by Blood-letting, ſlender Dyet, refrigerating Medicaments and Nouriſhments, as alſo drying and gentle Aſtringents.

The ſecond is caus'd by the falling down of evil and corrupt Humors and Phlegm from the Brain and Liver, and other Bowels to the Spermatic Veſſels, the retentive faculty of which is thereby endamaged, and ſo thoſe putrid Humors flow forth with the Seed. This as it ſeldom happens to Men, ſo is it very frequent among Women, and hard to be Cured; nor is it to be Cured, until you can firſt remove the vitious Diſtemper of the Bowels, which ſends thoſe humours thither.

The third proceeds from the exceſſive uſe of Venery, by which the Spermatic

Spermatic Parts being weary'd and extinguiſh'd are refrigerated & grow languid, and gather together crude and cold Humours, by which their concoctive and retentive faculty being looſened, they can neither concoct nor retain the Seminal matter. This is eaſily got by Elderly People, leſs uſed to Venery, who not meeting ſo often with Opportunities to delight themſelves, force all their Nerves ſo ſtrenuouſly when they come to it, that they weaken the ſtrength of the whole Body, and having waſted the ſtrength of the Seminal Parts, ſuch a Gonorrhea enſues, accompany'd with a weakneſs of the Loins. This is Cured by corroborating Medicaments and Nouriſhment, hot and gentle Aſtringents, having made uſe before of Purgatives and Diuretics, to free the Urinary and Seminary Paſſages, from the Crude and Viſcous Humours collected therein; which done the Cure eaſily proceeds.

The fourth which they call *virulent*, is contracted by coition with thoſe that have the Pox: of which Infection, it is often a fore-runner, and as often a moſt faithful Companion, as being deriv'd from the ſame Cauſe, and which cannot be ſafely cured before the perfect Cure of the Pox. In this there is a ſtinking Poyſon of a White and Greeniſh colour, that diſtills inſenſibly from the Seminary Veſſels, and frequently corrods the Pipe of the Yard, which cauſes ſharp pains upon Erection and making Water, and thence alſo Ulcers and Caruncles grow in the Urinary paſſage. And beſides if this virulent Running be ſtopped unskilfully for the moſt Part it occaſions Apoſthumes either about the Teſticles, which then begin to ſwell very much, or elſe about the Seminary veſſels, and thence Veneral Buboes. Many times alſo the Venom aſcending inward, and infecting the Liver and other Bowels, communicates the Contamination to the whole Body.

OBSERVATION. V.

A Scald.

Wiggerd Simonis was melting a good quantity of Roſin upon a quick Fire; which being too hot, the Flame got hold of the Kettle; now as he was going to put out the Flame and cover the Kettle with a Pillow, unwarily he thruſt both his hands into the ſcalding and boyling Roſin; and the ſame thing happened to him, that went about to help him to put out the ſame Flame: ſo that both moſt greviouſly complained of the pain that their hands were in. A preſent remedy was requiſite, but having none at hand, I bethought my ſelf of a whole Bottle of Ink that I had in my Study: this I powred forth into a Pot, and bid them both plunge their hands into it, and for ſome time to waſh and foment with it; which when they had done for half an hour the Heat and Pain ceaſed; nor did any Bliſters riſe, nor did they receive any damage by ſo terrible a Scald.

OBSERVATION. VI.

The cloſing of the Eye-lid by reaſon of a Wound.

A Young Country Girl had fallen from a high place, and with the fall had received a great wound in the right Eye-brow, that is to ſay, in the inner part next the Eye; by which wound the Bone of the *Cranium* was laid half bare, and the Eye-brow being cut croſs-ways, the upper Eye-lid hung over the lower. A certain Chyrurgeon had quickly Cured the wound; but after the Cure of the wound the upper Eye-lid would never riſe of it's own accord; nor could the Maid open her Eye, but by the Aſſiſtance of her Fingers; many Topics were apply'd by ſeveral Chyrugeons to remedy this defect; but none of them availing, after ſome Months my Aſſiſtance was deſired. When I had viewed the Place affected, I perceived the Miſcheif was incurable

incurable, and therefore adviſed them to forbear any further Applications. However the Maid, by the advice of others, who put her in great hopes, for a whole Year together, applied ſometimes one thing ſometimes another, till at length receiving no benefits he quite gave over.

ANNOTATIONS.

HEre the ſtreight Muſcle of the Eye-lid was cut. Moreover the unskilful Chyrurgeon at the beginning had not ſufficiently clos'd the Lips of the wound; ſo that afterwards a thick Scar being grown over it, the Muſcle could no longer preform it's Duty; ſo that there was no Man that underſtood Anatomy but might perceive the Wound to be incurable.

OBSERVATION VII.

A Dyſury or difficulty of making Water.

A Young Son of *N.* a Domeſtic Servant of the Lord *Dolre*, a Boy of five Years of Age, made Water for ſome Months with great difficulty, and in extream pain and miſery; and which alſo many times ſtopped at the time it ſhould have Evacuated. The Parents had taken the Advices ſometimes of Chyrurgeons, ſometimes of Old Women, and ſometimes of Strowling Mountebanks: but at length in *December*, my advice was deſired. Thereupon after I had gently Purged his Body with Powder of Diacarthamum, and Syrup of Succory with Rhubarb, ordered him to take a Draught ſeveral times a day of the following Apozem, which the Boy impatient of the pain greedily ſuckt up.

℞. *Roots of reſt Harrow or Cammock, Sea Holly, ſliced Licorice an.* ℥. ſ. *Flowers of Cammomil two handfuls, Seeds of Lettice, Parſley, Dill, an.* ℥ij. *Fat Figs.* n°. vij. *new Milk and Water an.* lb. ij. *boyl them to the Conſumption of the third part, then ſtrain them.*

After he had uſed this Apozem two days, he voided every day much viſcous and tough Matter together with his Urin; and after he had made uſe of two of theſe Decoctions, he was quite freed from his troubleſome Diſtemper.

ANNOTATIONS.

THere are various Cauſes of the difficulty of making water, Inflammation, Impoſthume, Stone in the Bladder, the Fleſh grown over, a cold Diſtemper of the Bladder and Sphincter, thick and viſcous humors either mixed with Urine, or ſticking cloſe to the Bladder and it's Sphincter, with ſeveral others of the ſame Nature; of which the two latter are the moſt frequent. But all in particular do not only cauſe a difficulty of Urine, but ſometimes abſolutely ſtop the Urine, as it happened to the Boy before mentioned which they who cut off the Stone had viewed, and thought he had the Stone, and judged him to be cut. But I believing his Diſtemper aroſe not from the Stone, but from a thick and tenacious Flegm that ſtopped up the Bladder and the paſſage of it, as I had obſerved had frequently happened to younger Children, rather choſe to begin the Cure with attenuating, lenifying, and Diuretic Medicaments, ſeeing that many times ſuch Medicaments

expel little ſtones alſo. But in this caſe, when Children cannot ſwallow ungrateful Medicines, I have known flowers of Camomil boyl'd in new Milk with Figs, do a great deal of good, eſpecially, if after the boiling and the ſtraining, the ſaid Flowers be lay'd to hot to the Region of the Hair, and the Decoction at the ſame time given to drink. *Foreſtus* in the ſame caſe commends Pellitory and Chervil boiled, and applied hot to the Region of the Hair, with Butter and Oyl of Scorpions. *Mercurialis* applauds Garlick bruiſed and applied to the Bladder. *Amatus* of *Portugal*, extols a Turnep hollow'd, and fill'd with Oyl of Dill, and then roaſted in the Embers, afterwards bruiſed and laid on.

OBSERVATION VIII.

Suppreſſion of the Courſes.

Joan Elberty, a ſtrong Maid of about twenty four Years of Age, complained that her Purgations had ſtopped for four Months, ſo that ſhe was in a very bad Condition, tortured with pains in her left ſide and Head, ſometimes troubled with Suffocations, and her Stomach quite gone. After I had ordered her an attenuating and heating Diet, and forbid her all things that generate tough and viſcous Humours, the ſixth of *January* I Purged her with Electuary of Hiera Picra, then I preſcribed her this Apozem to drink three times a day.

℞. *Roots of Lovage, Maſter-wort, Fennel, ſtone Parſley, Valerian an.* ℥. ſ. *Saſſafraſs-wood* ℥iij. *Nep, Mug wort, Peny-royal, white-Mint, Fever-few an. one handful. Flowers of Camomil half a handful, Seeds of Lovage, wild Carrots, Gith, an.* ℥ij. *Laurel Berry* ℥j. ſ. *Tartar of Rheniſh-wine* ℥vj. *ſtoned Raiſins* ℥ij. *common Water* q. ſ. *boyl theſe for an Apozem of two pints.*

The 11*th.* of *January* I Purged her again with an Infuſion of the Flowers of Senna and Agaric, with a mixture of Hiera Picra. The next day I preſcribed her another Apozem to drink like the former.

℞. *Root of Maſter-wort* ℥j. *of Elecampane, Valerian, Parſley an.* ℥. ſ. *Dittany, round Birth-wort an.* ℥iij *Mug-wort, Nep, Savin, Fever-few, Rue, Peny-Royal, an. one handful. Southern-wood, Flowers of Camomil an. one handful, Seeds of Parſley, Gith, Lovage, wild Carrots an.* ℥j. ſ. *red Vetches* ℥j. ſ. *common Salt and White-wine, an. equal parts; make an Apozem for two pints.*

Fourteenth of *January* I preſcribed her this Electuary, of which ſhe was to take the quantity of a Filberd, before ſhe drank of her Apozem.

℞. *Specier. Diacurcume, Cremor Tartar, Trochiſts of Myrrh, Hoglice prepared, Steel prepared an* ℥j. *ſeeds of Parſley, Nep, Venetian Borax an.* ℥. ſ. *Salt Prunella, Eaſtern Saffron an.* ℈j. *reduce all theſe into a very fine Powder, to which add, Oyl of Juniper, Amber an* ℈j. *of Dill drops* vij. *Electuary of Hiera Picra* ℥. ſ. *Syrup of preſerved Elecampane Roots* q. ſ. *make an Electuary.*

Moreover becauſe ſhe felt a hardneſs at the bottom of her Belly about her Navel, I preſcribed this Sere-cloth.

℞. *Gum*

℞. *Gum Opoponax, Galbanum diſſolved in Vinegar, Emplaſter de Cumino, of Melilot an.* ℥ij. *of Caſtor Pulverized* ℥j. *mix them and make them into a Roll to be ſpread* q. ſ. *upon red Leather.*

The nineteenth of *January* ſhe was let Blood in the Saphena Vein of the left Foot, and bled indifferent well. The laſt Apozem was repeated again, which ſhe took together with her Electuary till the twenty eight of *January*, at what time her courſes came down very copious, after that ſhe was very well in Health.

ANNOTATIONS.

A Long ſuppreſſion of the Courſes is oft-times the Cauſe of very great Diſtempers. For from hence ariſe Suffocations of the Matrix, and the pale Colours of Virgins; hence Palpitations of the Heart, Vertigo's, terrible pains in the Head, Joynts, Back and Loyns, Fevers, Swooning Fits, Coughs, difficult breathing, Cholic and Nepheretic pains, and laſtly, the evil continuing long, Melancholy Paſſions, ſwelling of the Bowels and Dropſies. Therefore the Cure is not to be delay'd; for the longer the Courſes ſtop, with ſo much the more difficulty are they provoked to come down. The Cauſe of this Diſtemper is the Narrowneſs of the Veſſels of the Womb; which again are accompanied with ſeveral other Cauſes, as Obſtruction, Conſtipation, Coaleſcence, or growing together, Compreſſion and Settlement. But the moſt frequent Cauſe is an obſtruction occaſioned by thick and viſcous humors: Which thickneſs and viſcouſneſs is either in the Blood it ſelf, when it is too cold or viſcous; or elſe when Excrementitious, Flegmatic and Melancholy Humors are mixd with the good Blood; and with that good Blood carried to the Veins of the Womb where they cauſe the Oppelation. But this Obſtruction and Viſcouſneſs of the Humors, as it is more or leſs, or has been of longer or ſhorter Continuance, ſo the Cure is performed by gentler or more violent Medicaments, with more eaſe or more difficulty. But in the Cure of our Patient, we were forced to uſe the ſtronger Medicaments, as well in regard of the cold ſeaſon of the Year, as the greatneſs of the Obſtruction. For ſhe was wont to eat green Fruit and courſe Meats, that beget a viſcous and cold Nouriſhment, which had gathered together a great quantity of the thick and crude Humors.

OBSERVATION IX.

An incurable Hoarſneſs.

A *Holland Boor* in a quarrel between Carters, had received a wound with a Knife in the right ſide of his Neck near his Throat. The wound was ſoon cured by a Chyrurgeon. After ſome Months he came to me to preſcribe him ſomething for an Extraordinary hoarſneſs, with which he began to be troubled ſo ſoon as he had received the wound, and which the Phyſitian, who had had him in Cure, together with the Chyrugeon, could no way remove with all the Looches, Lozenges and Decoctions which they could give him. His voice was ſo ſmall and hoarſe that you could hardly underſtand what he ſaid; but I obſerved that there was a Nerve which run back athwart from the Wound which was cut, through which the vertue of forming the Voice is conveighed; whence it came to paſs that half the Vocality was defective, which when it could not be reſtored by any Remedies, I refuſed to meddle with him as one that was not to be cured.

ANNOTATIONS.

THE Vocal Nerves, which conveigh the Vertue of forming the Voice, by *Galen* call'd the Recurrent Nerves, riſe from the ſixth Conjugation, and creep through the Throat to the *Larynx*. *Galen* extols their admirable Vertue in forming the Voice with a large Encomium. And *Laurentius*, *Columbus* and *Bauhinus* give us a curious Demonſtration of theſe Nerves in their Anatomical Treatiſes. Both theſe Nerves being cut, the Creature becomes mute; but if only one, but half his Voice remains. This Boor had but one Nerve cut, and ſo kept half his Voice; for had he been cut in the ſame manner on the other ſide, he would have been quite Dumb. *Columbus*, in the Diſſection of a living Dog, has elegantly demonſtrated the wonderful Efficacy of this Nerve toward the forming of the Voice. But *Galen* was the firſt that made known the Uſe of theſe Nerves, and confirms the ſame with this Hiſtory. *A certain Chyrurgeon*, ſays he, *having cut out the Kings-Evil out of the Neck, that lay deep in the Fleſh; as he drew the Scroffles out with his Nails, out of Ignorance, he alſo tore out the Recurrent Nerves along with them; by which means, he freed the Boy from the Scroffles, yet he took away his Voice and left him quite mute. Another Chyrurgeon having made an Inciſion in another Boy, took away half his Voice, by cutting one of the Nerves, which made all the People ſtand amazed, how it ſhould come to paſs, that neither* Aſpera Arteria, *nor the Throat being touched, the Voice ſhould be prejudiced; but ſo ſoon as I ſhewed them the Vocal Nerves, they ceas'd admiring.* *Avicen* alſo has a Story like this, of the Scroffles ill cut, *a certain Perſon*, ſays he, *miſtook, when going about to perforate certain Scroffles, he met with a Branch of the Turn-again Nerves, by which means, he cut away half the Voice of his Patient.* In like manner, *Amatus* of *Portugal*, tells us a Story of a Woman that had the Kings-Evil in her Neck, to eat out the Roots of which, the Chyrurgeon put in Sublimate, by the Acrimony of which, one of the Recurrent Nerves was corroded, and the Woman almoſt loſt her Voice. Nor is it only the Inciſion of this Nerve, but the Refrigeration of it, that uſes to ſpoil this Nerve, which *Galen* confirms bythis Story. *I remember*, ſays he, *a Voice ſo prejudiced, that it was almoſt loſt, and the recurrent Nerves being refrigerated to exceſs, by an Inciſion made in the Winter time; which when I underſtood, by the Application of hot Remedies, reſtoring the Nerves to their natural Temper, I reſtored alſo the Patient his Voice.* In like manner ſays *Avicen*, *There was a Perſon whoſe Turn-again Nerve was over-cool'd, there being a Neceſſity of long applying cold Iron to his Neck, and ſo he loſt his Voice.* *Gentilis* affirms, That there was ſome Apoſtume in that Part which was to be cut. So that the Apoſtume being cut, and the Nerve laid bare, in regard it was Winter, and the Air was very ſharp, the Cold got into the Nerve and ſpoiled the Patients Voice.

OBSERVATION X.

A Palſie.

WE ſaw a ſtrange and wonderful Cure of a Palſie in *Suſan Smacht*, a moſt noted Woman, the Siſter once of the Sexton of the Church of *Montfort*. This Woman, when ſhe was a Girl of about ſix years of Age, being terribly frighted by an Accident, preſently fell into a Palſie of her whole Body, except her Head. She was under the Hands of ſeveral Phyſitians and Chyrurgions, eminent at that time, who, by the Application of ſeveral Medicaments, reduced the Diſtemper to that paſs, that all the reſt of the Parts being recovered, only both her Thighs and Legs remain'd paralytic, from the Loyns to the Feet, ſo that ſhe could neither ſtand nor go; in this Condition ſhe lived a miſerable Life, till the forty forth Year of her Age, at what time ſhe was miraculouſly cur'd of her Diſtemper, after the following manner. In the Month of *June*, about Midnight, aroſe a

moſt

moſt terrible Tempeſt, with Thunder and Lightning, with which ſhe was ſo dreadfully and unuſually frighted, that at the ſame time ſhe was delivered from her deplorable Diſeaſe. The next Morning, to the Admiration of all that beheld her, ſhe was ſeen walking before her own Door, giving Thanks to God for her unexpected Cure. Thouſands of People, not only in the Town and Places adjoyning, but alſo from Cities remote, crouded to ſee her, and all admired her miraculous Recovery. By others, being asked how this Cure was performed, ſhe anſwered, that ſhe was extreamly terrified by the Thunder and Lightning, and pray'd to God continually, but that during the terrible Tempeſt, her Brother the Sexton knock'd at her Chamber Door, and while ſhe was thinking to creep, as ſhe uſed to do, and to that end was feeling for her Crutches, that always ſtood by her Bed-ſide, but could not find them where ſhe thought ſhe had ſet them, a vaſt Flaſh of Lightning diſcovered them to her at the other ſide of the Bed. Whereupon ſhe prepared her ſelf to creep along upon her Arms to reach her Crutches: But when ſhe was about to put her Legs out of the Bed, (at what time, ſhe ſaid ſhe heard and ſaw ſomething, but what that was, ſhe never would diſcover to any Body) ſhe found that ſhe could ſtand, and ſo, without any help, went to the Door and open'd it. And this very Relation ſhe gave to U. more than once. Her Brother the Sexton, who had known his Siſter to be paralytic for forty Years together, when he ſaw her open the Door and walk briskly about the Chamber, was ſo aſtoniſhed, that for fear he fell into a Swoon. The next day, and the days following, the ſaid *Suſan* expoſed her ſelf to be publicly ſeen. I my ſelf alſo knew her for many years, and have ſeen her a thouſand times in that miſerable Paralytic Condition, and afterwards ſaw her alive for fifteen years or more, a ſound Woman, and free from ſo dreadful a Misfortune.

ANNOTATIONS.

THere may be given a manifeſt natural Reaſon for ſo miraculous a Cure; that is to ſay, that the Humor which faſtened upon the Nerves, upon her firſt Fright, was again looſned from them by this more vehement Terror. As for the Patients ſaying ſhe ſaw and heard ſomething, I know not what, I leave that to the Judgment of the Reader; perhaps ſhe imagined ſomething in her fear that was not really ſo. In the mean time, that there have been other unexpected Cures of the Palſie, is certain, by the Teſtimony of ſeveral Authors. Thus *Valleriola* tells us a Story of a Citizen of *Arles*, affected with a Diſſolution of both Sides, and deſtitute of all Humane Aſſiſtance, as one whom neither the Induſtry of the Phyſitians, nor ſeaſonable and proper Applications, nor Obſervance of Diet could relieve, who at length, upon a vehement dread of Death, and being burnt in his Bed, the Houſe wherein he lived being on fire, was of a ſudden delivered from that deplorable Diſeaſe; Senſe and Motion being reſtored to the Languid Parts. The ſame Author relates another Story of a Couſin German of his, who had been Paralytic ſix years of both his Thighs, who nevertheleſs, being provoked by one of his Servants into a vehement and ſudden Paſſion, recovered his Limbs, and lived a ſound Man to his dying Day. And thus ſudden and exorbitant Commotions of the Mind have cur'd not only the Palſie, but other Diſeaſes incurable by Art. Thus *Herodotus* teſtifies, that the Son of *Cræſus* born Dumb, when he ſaw a *Perſian* running upon his Father to kill him, became vocal, and cry'd out, Friend, do not kill *Cræſus*, and ever after that ſpoke like other Men. The ſame *Valleriola* reports, that he ſaw a Perſon cured of a Quartan Ague, through the vehemency of a ſudden Paſſion, when no manner of Phyſical Remedies could cure the Diſtemper before.

OBSER-

OBSERVATION XI.

Bleeding at the Noſe.

Charles N. an Ale-Brewer, in the Month of *October*, drinking and dancing to Exceſs at his Siſter's Wedding, of a ſudden, in the midſt of a Dance, fell flat to the Ground upon his Face, and by the Vehemency of the Fall, broke a Vein in his Noſtrils, which cauſed ſuch an abounding Flux of Blood, as if the *Median* Vein in his Arm had been cut. Preſently Cloaths dipp'd in Water and Vinegar were clap'd about his Neck and applied to his Noſtrils, Ligatures faſtned about his Extream Parts, but nothing would prevail. Inſomuch that the Patient, as well becauſe he was heated with Drink, as by reaſon of the Pain of the Fall, ſwooned away. Thereupon, ſeeing nothing would do, and becauſe there was no Chyrurgeon at hand to open a Vein, I ordered a Towel four times double to be ſoaked in cold Water, and apply'd to his Teſticles, which being twice repeated, contrary to the Opinion of the Standers by, not only ſtopp'd the Blood, but recovered him to his firſt Sobriety.

OBSERVATION XII.

The Itch.

Cornelius Johannis was troubled with a dry Scab, or running Itch, with dry Cruſts, and little Scales upon his Skin, that itch'd intollerably, eſpecially in the Night, when he grew warm in his Bed. The Cruſts being ſcratched off, by reaſon of the Itching, with his Nails, under them the Skin being a little raiſed, appear'd very dry, red, and rough, and then came Cruſts and Scales like the former, ſo that the common People thought him to be infected with the Leproſie. This Diſtemper ſeized the lower part of his Belly, his Thighs and Legs, in ſuch a manner, that by reaſon of the dry Cruſts or Scales, the bare Skin was not to be ſeen in any of thoſe Parts. His Arms alſo and Breaſt were infected in ſome places. Two years before, upon the *Criſis* of a Quartan Ague (for the Cure of which, for fifteen Months together, by the Advice of that famous Phyſitian, *D. Gallus* and others, who judged his Diſtemper to proceed from a vitiated Spleen, ſeveral Medicines, both inward and outward, had been in vain made uſe of,) the Diſeaſe not only abating, but rather encreaſing; at length I was ſent for to a Conſultation, and ſeeing the Perſon of a ſtrong Conſtitution, and in good Health, excepting only the aforeſaid Diſtemper, and obſerving there was no Sign, either of Spleen, Liver, or any other Bowel affected, I judged by that ſame *Criſis* of the Quartan Ague, that all the noxious, ſharp, and vitious Humors were expell'd out of the Spleen to the Skin, and ſo his Spleen recovered its former Soundneſs, but that the Skin was deeply infected with that dry Scab, and that the Cauſe of the Diſtemper lay no longer in the Spleen, but only remain'd deeply fixed in the Skin; and that the Skin ſo infected, contaminated alſo the Juices and Humors flowing thither every day for its Nouriſhment; as a Veſſel that has contracted any Filth, infects the beſt Wine that is poured into it. And indeed the Event of the Cure prov'd the truth of my Judgment. For

then

then I reſolved to tame this obſtinate Diſtemper, not ſo much by Internal, as by Topical Medicaments, and thoſe not gentle ones, but ſtrong Remedies anſwerable to the Greatneſs of the Evil, and the Pertinacy of the Matter, ſince many other things, which others had try'd, would do no good. To this purpoſe, his Body being well purged before hand, in *March* I preſcribed a Fomentation, with which, being luke-warm, to foment the Parts infected twice a day, for five or ſix days together.

℞. *Roots of Briony* ℥iij. *Worm-wood, White Hore-hound, Pimpernel, Plantain, Centaury the leſs, an.* Handfuls iij. *Oak-leaves* Handfuls iiij. *Elder-flowers* Handfuls ij. *boil them in common Water* q. ſ. *to ten Pints, adding at the end Roman Vitriol* ℥j. *Alum* ℥j. ſ. *for a Fomentation.*

After Fomentation, the Parts being dry'd with a Linnen Cloth, I ordered them to be anointed with our Oyntment againſt the Shingles. After ſix days Fomentation was diſcontinu'd, and only the Oyntment uſed, which in a few Weeks carried off a great part of the Diſtemper. This Oyntment the Patient uſed all the Summer, till *September*, by which time he was almoſt cured, excepting only three or four places about the breadth of a Dollar, which would not ſubmit to this Oyntment, but ſtill produced new cruſty Scales. Wherefore, the ſixteenth of *September*, I prepared him the following Oyntment.

℞. *Quick-ſilver* ℥j. ſ. *Turpentine* ℥iij. *To theſe well mix'd add the Yolk of one Egg, Unguent. Populeum* ℥vj. *of our Oyntment againſt the Shingles* ℥j. ſ. *mix them for an Oyntment.*

Theſe Remainders were very hard to be extirpated, and therefore I was forced to continue the Uſe of this Oyntment a little longer, augmenting afterwards the Quantity of Quick-ſilver; alſo I again apply'd the foreſaid Fomentation; and thus at length this naſty troubleſome Deformity of the Skin, which others deſpaired of ever curing, was at length abated and vanquiſh'd, ſo that about the ſecond of *November* it vaniſh'd quite and the Patient continued free from the ſame all the reſt of his Life.

ANNOTATIONS.

THE Itch, by the Greeks called *Lichen*, by others *Serpigo*, from *Serpo* to creep, is a hard Aſperity of the Skin, with dry Puſtles, and a violent Itching, creeping and extending it ſelf to the adjoyning Parts. *Galen* aſſerts two kinds of this Diſtemper. *There are two ſorts*, ſays he, *of the Itch, that moleſt the Skin.* The one tolerable and more gentle, the other wild, and difficult to be removed. In theſe the Scales fall off from the Skin, under which, the Skin appears red and almoſt exulcerated. *Celſus*, who by the Word *Impetigo*, ſeems to have underſtood ſome other Diſtemper, deſcribes this Itch of *Galen* under the Name of *Papula*, and makes alſo two ſorts of it. *The one*, ſays he, *is that the Skin is exaſperated by the ſmalleſt Puſtles, and is red, and ſlightly corrodes, in the middle ſomewhat lighter, and creeps ſlowly; it begins round, and dilates in a Circle. The other, which the* Greeks *call* ἄγριον, *or the wild Itch, is that by which the Skin becomes more rough, is exulcerated, and vehemently corroded, looks red, and ſometimes fetches the Hair off, which is leſs round, and more difficultly cured.*

As for the Cauſe of the Diſeaſe, *Galen* *Ætius*, *Ægmeta* affirm it to be generated out of certain mix'd Humors, that is to ſay, ſerous, thin and ſharp, mix'd with thick Humors. But in my Judgment,

ment, *Galen* writes better, and more perſpicuouſly, that this Diſtemper is generated out of a ſalt Flegm and yellow Choler, which is the reaſon, that as in earthen Veſſels corroded by Pickles, the Scales fall off the Skin. Now theſe Humors being tranſmitted to the Skin, putrifie it, as *Avicen* ſays. To which I add, that this Corruption afterwards is intermixed with the good Humors, carried to the Skin for its Nouriſhment, and ſo the Miſchief becomes diuternal. Thus alſo *Mercurialis* writes, that the Skin only having acquir'd a deprav'd Habit, corrupts all its Nouriſhment, and converts it into increaſe of Impurities. And in the ſame manner, diſcourſing of ſuch a kind of ſcabby Patient. In the whole Circuit of the Body, there is a vitious and itchy Humor implanted, by vertue of which, whatever good Nouriſhment is carried to it, is preſently converted into a naſty ſalt corroding Humor, which occaſions that continual Itching, together with thoſe little Ulcers, and the roughneſs of the Skin. Now theſe Humors corrupting the Skin, muſt of neceſſity be hot and ſalt, from which proceeds that Heat and Itching of thoſe Scales. This Diſtemper however is not ſo dangerous as it is trobleſome, which if it continue long, gets that deep footing, that it is a very difficult thing to extirpate it; and ſometimes it hardens into a dry Mange and Leproſie.

The gentler ſort is cur'd at the beginning with gentler Medicaments, as Faſting-Spitle, toſted Butter, Oyl of Eggs, of Tartar, or Juniper, boyled Honey, liquid Pitch, or Juice of Citron. But that which is of longer continuance and wild, requires ſtronger Remedies, as Sulphur, Minium, Lytharge, Ceruſe, Vitriol, Pit-ſalt, Ruſt of Braſs, Lime-allum, Niter, white Hellebore, *&c.* To which we may add Quick-ſilver, Sublimate, and precipitate, Mercury having a peculiar occult, yet apparent Quality, to kill the Malignity that accompanies this Diſtemper. Thus *Peter Pachetus*, in his Obſervations communicated to *Riverius*, when no other Remedies could tame a wild Itch, cur'd it with this Oyntment.

℞. *Unguent. Roſaceum* ℥ iij. *White Precipitate* ℥ iij. *Mix them for an Oyntment.*

OBSERVATION XIII.

A Mortification of the Legs and Thighs by Cold.

MAny times ſevere Miſchiefs attend the Imprudence of Perſons given to drink; which a certain luſty young Man, ſufficiently made known by his own woful Example. For he in a moſt terrible Winter, when it freez'd vehemently hard, coming home about Midnight well Cup-ſhot, without any body to help him to Bed, went into his Chamber, where falling all along upon the Floor, he fell aſleep, and neither remembring himſelf nor his Bed, ſlept till Morning. But when he awak'd, he could feel neither Feet nor Legs: Preſently a Phyſitian was ſent for. But there was no feeling either in his Legs or Feet, though ſcarified very deep. Hot Fomentations were apply'd, of hot Herbs boil'd in Wine, adding thereto Spirit of Wine; but to little purpoſe. For half his Feet, and half his Legs below the Calves were mortified, the innate Heat being almoſt extinguiſhed by the Vehemency of the intenſe Cold. The Fomentations were continued for three days. Upon the fourth day, the mortified Parts began to look black, and ſtink like a dead Carcaſs. Therefore for the Preſervation of the Patient, there was a neceſſity of having recourſe to the laſt Extremity, namely, Amputation, and ſo upon the ſixth day both his Legs were cut off a little below the Calves in the quick part; by which means, the Patient eſcaped without his Feet, from imminent Death, and afterwards learn'd a new way to walk upon his Knees.

ANOTA-

ANNOTATIONS.

AN Example of the ſame Nature we ſaw at *Nimeghen*, in the Year 1636. of a *Daniſh* Souldier, who having ſlept, Drunk, as he was, upon a Form, in a bitter froſty Night, when he walk'd in the Morning could not feel his Feet. But by heating Fomentations, the native Heat, at moſt extinguiſhed by the Cold, after two days fomenting, was reſtored to his Feet, tho his Toes could never be brought to their natural Conſtitution; but remaining mortified, and beginning to putrifie, were all cut off by the Chyrurgeon. And therefore I would adviſe all hard Drinkers not to take their Naps too imprudently in the Winter, unleſs they have firſt laid themſelves in a warm Place, and well fortified themſelves againſt the Injuries of the Air, leaſt their being buried in Wine, bring them to be buried in Earth.

OBSERVATION XIV.

Obſtruction of the Spleen.

KAtharine N. a Woman of forty four years of Age, had been troubled a whole year with an Obſtruction of her Spleen; much Wind rumbled in the Region of her Spleen; ſhe was tormented with terrible Pains of the ſame Side, by reaſon of the Diſtention of the Bowels and the neighbouring parts; ſo that ſhe went altogether bow'd toward the Side affected, till at length, grown as lean as a Skeleton, with continual Torments, ſhe could go no longer. You might alſo perceive by laying your Hands upon the Place, that the Spleen was very much ſwell'd; and more than all this, her Stomach was quite gone. In *March*, being call'd to the Cure of this Diſtemper, I firſt purg'd her Body with a gentle Purge; upon which, when ſhe found but very little Relief, I preſcribed the following Apozeme for two days, to open the obſtructed Paſſages, and prepare the Morbific Matter, and withal, to keep her Body open.

℞. *Roots of Polypody of the Oak, Dandelyon an.* ℥j. *Roots of Fennel, Elecampane Stone Parſly, Peeling of Capery-roots, Tamariſc an.* ℥ſ. *Baum, Fumary, Water Trefoil, Tops of Hops, an.* Handful j. *Centaury the leſs*, half a Handful. *Fennel-ſeed* ℥ij. *Damask Prunes* n° xi. *Currants* ℥ij. *Boil them in common Water* q. ſ. *In the ſtraining, macerate all night, of Spoonwort, Winter Naſturtium an.* Handful j. *Leaves of Senna cleanſed* ℥ij. *Aniſe-ſeed* ℥vi. *Make an Apozeme for two Pints.*

After ſhe had drank two Mornings a Draught of this Decoction, ſhe went to Stool twice or thrice a day, but the Eaſe which was expected did not follow. Wherefore, after ſhe had drank up her Apozeme, I gave her a purging Medicine ſomewhat ſtronger, which I thus preſcribed.

℞. *Leaves of Senna cleanſed* ℥ſ. *White Agaric* ℥j. *Roots of Black Hellebore* ℥ſ. *Rheniſh Tartar, Aniſe-ſeed an.* ℥j. *Fumary Water* q. ſ. *Make an Infuſion all night, and add to the ſtraining Elect. of Hiera Picra, Diaphœnicon an.* ℥ij. *for a Draught.*

After ſhe had taken this, at firſt ſhe voided common Excrements. Soon after ſhe felt an extraordinary Pain in her Left-ſide, which preſently removed from thence to the Guts; which Pain weakned her to that degree, that ſhe went away ſometimes in a Swoon. Not long af-

ter, ſhe voided a certain black Water, like Ink, in ſo great quantity, that ſhe fill'd three whole Chamber-pots to the top. From hence ſhe felt an extraordinary Eaſe, and the Pains of her Left *Hypocondrium* went almoſt quite off. Four days after I gave her the ſame Purge again; upon which, ſhe voided again a great quantity of black Water, but not ſo black as before, neither was it ſo black as the former, as not being much unlike the Lye in which our Country-women boils their Linnen Spinnings. After this Evacuation, ſhe was terribly griped in her Belly, wherefore, about Evening, I preſcribed her Methridate *Democ.* ℥j. with five Drops of Oyl of Aniſeſeed, in a Draught of heated Wine. After the uſe of theſe Medicines, the Patient grew indifferent well, and in regard ſhe began to loath Phyſic to that degree, that ſhe could not endure to hear the Name of Phyſic, we were forced to defer the reſt of the Cure till *May*, only ordering her to obſerve a proper Diet. But in *May* ſhe drank three Apozemes again, was three or four times purged, and took her Electuary, and ſo was reſtored to her priſtin Health.

ANNOTATIONS.

THis Woman, for two years before, had loſt her monthly Evacuations, and from that time the Diſtemper of the Spleen began to ſeize her more and more, till ſhe became altogether Melancholy. Whence it is very probable, that the failing of her accuſtomed Evacuations, that ſling off many other Excrements of the Bowels, was the Cauſe of the Accumulation of this Melancholy Humor in the Spleen and Neighbouring Parts, which now wanted the uſual paſſage of Evacuation through the Womb. Therefore ſays *Sennertus*, The accuſtomed Evacuations of the Hemorrhoids and Courſes being ſuppreſſed, conduce very much to accumulate vitious Humors in the Spleen.

Thus we have ſeen in our Practice, that Women after their Purgations have left them, have fallen into ſeveral Diſeaſes, becauſe the noxious Humors that were evacuated with the menſtruous Blood, were then retain'd in the Body. And therefore when Womens Purgations fail through Age, they ought to purge often, to the end the excrementitious Humors that want to paſs through the Womb may be drawn to the Guts.

As to the black Evacuations, it is indeed a Wonder how theſe melancholy Humors heap'd together in our Patient, could be retain'd in the Body without doing any more harm, and could be changed into a Blackneſs like Ink. Beſides, *Hippocrates* tells us, that black Stools are dangerous and mortal. Tho *Petrus Salius* well adviſes the Phyſitians not always to fear thoſe black Stools, wherein there is nothing many times of danger: For if the Spleen be out of order, this Matter gathers together about the Bowels in great abundance, and in thoſe Veins which are common to them; which if it be in great quantity, it gathers alſo about the Meſentery and Sweet-bred, which are, as it were, the Sink of the whole Body, and then when it grows burthenſome to Nature, is expell'd, to the great Eaſe of the Patient, by the Expulſive Faculty, excited either of its ſelf, or by Medicaments, the Evacuations of which are black. However, that Melancholy Matter ſo collected, is not always expelled through the Guts, but alſo to the great benefit of the Patient, ſometimes by Urine, which *Mercurialis* alſo teſtifies. *Nor are you to wonder*, ſays he, *that Diuretics are by me preferred above other Medicines, ſince Reaſon tells, that Melancholy and Splenetic Perſons have black melancholy Blood.* With which agrees the Authority of *Ariſtotle*, in his Problems, but chiefly of *Hippocrates*, who gives us the Story of *Byas* the Fifty-Cuffer, who was cured of a Swelling in his Liver, by a Flux of Urine. For which reaſon, they that undertake the Cure of the Spleen, muſt make it their Buſineſs to provoke Urine: for which, we have a remarkable Story which *Valetius* relates in *Holler*. I knew, ſays he, a Religious Perſon, whoſe Liver ſwell'd three or four times a year, but chiefly at the beginning of Spring and Fall; and while that bunchy Tumor laſted, he was infeſted with Hypochondriac Pains, black and blew over

over his whole Body, and growing worſe and worſe by degrees. But at length, coming to make black Water, like to Ink, for five or ſeven days, he recovered his former Health, the Tumor and Pain of the Hypochondrium vaniſhing. And now for theſe twelve or fifteen years, he has had theſe Profluvium's of black Urine, whereas before he had the Hemorrhoid, which though they ſwell'd indeed, were not ſo open.

OBSERVATION XV.

A Wound in the Leg.

Andrew Joannis, a Cook, hapening to be drunk, and finding his Chamber-door ſhut, ſet his Foot to the Door with all his force; ſo that after he had broke it, his Leg paſt through the Slit with the ſame ſwiftneſs, and rak'd the middle of his Leg withinſide toward the Calf to that degree, that though the Solution of the *Continuum* were not very broad, yet it reach'd to the very *Perioſteum*, and by reaſon of the Contuſion in the Part, ſwell'd very much. A certain ignorant Chyrurgeon had had him in hand for ſome days, but his Pains increaſing, my Adviſe was deſired. By this time his whole Leg was ſwell'd very much, and began to look of a greeniſh Colour among the Black and the Blew, with moſt acute Pains, and the Colour ſufficiently demonſtrated that the Fore-runner of Mortification would ſoon contract a Gangrene, which I found to have been occaſioned by the Ignorance or Miſtake of the Chyrurgeon; for he having thruſt in a hard Tent into the Wound as far as the *Perioſteum*, had ſtop'd it ſo cloſe, that no Moiſture could come forth. For he had laid a defenſive Plaiſter over it, as broad as my hand, compoſed of *Bole Armoniac*, and other aſtringent things, then had wrap'd his Leg, from the Knee to the Foot, in a Linnen Roller dip'd in Water and Vinegar, and had ſwath'd all this extreamly hard, pretending, by this means, to prevent a Tumor and Inflammation. To ſay truth, the Wound was plainly raw and ill colour'd, without any Digeſtion; ſo that upon drawing forth the Tent, only a little watry Corruption came forth. All theſe things I threw away, and to prevent a Gangrene, took care to have the Wound waſh'd with Spirit of Wine, that no Tent ſhould be put in, but only that a Linnen Cloth four double, ſhould be laid upon it, and that the whole Leg ſhould be fomented with the following Fomentation.

℞. *Betony, Thyme, Wormwood, Sage, Hiſſop, Roſemary, Flowers of Camomil, Elder, Melilot, Roſes, an.* Handful j. *Seeds of Cumin and Lovage, an.* ℥j. ſ. *Laurel Berries* ℥ij. *White-wine* q. ſ. *Boil them to three Pints, add to the Straining Spirit of Wine* ℔ j.

This Fomentation being wrapt warm about his Leg, the next Night his Pain was much abated, and much of the watry Corruption run out of the Wound. Within two days after, the Swelling of his Leg palpably fell, and returned to its natural Colour, and threw out the Corruption well concocted, and ſo being dreſſed as it ought to be, the Cure was eaſily compleated.

ANNOTATIONS.

THings put into a Wound that ought not to be, are utter Enemies to Nature, endeavouring Conſolidation, eſpecially if they compreſs any nervous Body, Membrane or Tendon, or the Perioſteum. Hence terrible Pains, Tumors, Inflammations, and other Miſchiefs proceed; and therefore all ſuch things as are foreign to Nature, are to be taken away, as *Paræus*, *Pigius*, and other Chyrurgeons tell us. Thus hard and thick Tents, which inwardly offend and diſtend the Wound, or elſe ſtop it quite up, or compreſs the Nerves, Membranes, or Perioſtea, are not to be thruſt into Wounds, as being thoſe things that hinder the Operation of Nature, Suppuration, Erection of the Matter and Conſolidation, and beget Pains, Inflammations, and other Miſchiefs. Thus we have ſeen, by the Ignorance of Chyrurgeons, ſome Men tormented with Pains, others thrown into Fevers, Syncope, Convulſions, Mortifications and Gangrenes. As it had like to have befallen our Patient; who, beſide other ill Simptoms, was very near a Gangrene; and had it not been in time prevented, upon the Approach of the Mortification, he had hazarded the loſs of his Limbs, or his Life. Hence *Felix Wirtius*, in Wounds of the Hands and Joynts, rejects the Uſe of Tents; which Opinion *Hildan* refutes, who ſays, that Tents are neceſſary in the nervous Parts, to keep the upper Lips of the Wound open, and give paſſage for the Corruption. By which Doctrine it appears, that he praiſes thoſe Tents, which do not offend the inner Part of the Wound, but only keep the upper Parts open. But the Chyrurgeon, as to our Patient, had committed a great Error in this very Particular, for he had diſtended the inner Parts of the Wound with a thick and hard Tent, and had compreſs'd the Perioſteum, and prevented the Concoction and Efflux of the Corruption.

OBSERVATION XVI.

Suppreſſion of Urine.

THE Wife of *Gerrard Anthony*, a Taylor, had layn in, in *May*, and in three days after ſhe was brought to Bed, had not made Water, which was an extraordinary Pain to her, and had brought her ſo low, that ſhe could hardly ſpeak. The Mid-wife declared that ſhe was very well laid, but that preſently after her Evacuations were ſtopp'd, that ſomething hard was to be felt on the other ſide in the lower part of her Belly. Hence I gueſſed that there was ſome Superfœtation or Mole, which remain'd behind. For the Cure of which, and to provoke her Urine and Purgations withal, I preſcribed this Apozeme.

℞. *The Roots of Stone Parſly, Maſterwort, Valerian, Sea-holly, Cammock an.* ℥ſ. *Round Birthwort, ſliced Licorice an.* ℥ij. *Leaves of black Ribs, Mugwort, Peny-Royal, Water-Naſturtium, an. one Handful. Water-Parſly with the Whoſe, two Handfuls. Savine, Flowers of Camomil, an. half a Handful. White-wine* q. ſ. *Boil them for an Apozeme to a Pint and a half.*

℞. *Of the ſaid Apozeme* ℥iij. *Oyl of Amber diſtilled by deſcent, Drops* xx. *Make a Draught.*

This ſhe took hot the firſt time. This ſhe took after three hours again, upon which, ſeveral Motions of Child-bearing ſupervening, ſhe brought forth a round Mole, about the bigneſs of a Childs Head, which had the perfect Eyes of a Man. This being thus luckily expell'd

pell'd, her Urine and Purgations followed, and ſhe was preſently delivered from the imminent danger ſhe was in.

ANNOTATIONS.

MOles are of different kinds, ſome within, others without the Birth; ſome very dangerous and troubleſome to the Woman, others leſs hazardous; ſome without any Form, others reſembling ſome Shape or other; ſome having Life, others without Life. Sometimes they preſage ſomething of Good; for though they do not hinder the Birth, yet they are very prejudicial both to the Birth and the Mother. Which our Patient confirmed by her own Example, who had certainly dy'd, had not the Mole, expell'd by Medicaments, made way for her Urine and Purgations.

OBSERVATION XVII.

A Dyſentery.

GErard *Voſſius*, our Neighbour, had been troubled with a Dyſentery for ſome days; he was miſerably tormented with cruel Pains in the Guts, and many times he voided Excrements that were all bloody, and mix'd with a tenacious Slime; he ſlept not at all, his Stomac was gone; he was very thirſty, and he had a Fever, which though not vehement, yet was continual. Though the young Man were not above thirty years of Age, and very ſtrong, yet he was brought ſo low by theſe Miſchiefs, that in a few days he was reduced to an extream Imbecility. The ſixth of *February*, I gave him the following Purge, which brought away much Choleric Matter.

℞. *The beſt Rhubarb ſomewhat burnt* ℥ij. *Mirobans Indian, Citrine an.* ℥j. *Leaves of Senna cleanſed* ℥iij. *Aniſeed* ℥j. *White Poppy* ℥ij. *Plantain Water.* q. ſ. *Let them boil for half an hour. Add to the Straining Elect. Diaphœnicon* ℥j. ſ. *Mix them for a Draught.*

In the Evening, after his Purging, I gave him this Bolus.

℞. *Terra Sigillata, Nicholas's reſt an.* ℈j. *Mithridate Damoc.* ℈ij. *Mix them for a Bolus.*

The next day the following Apozeme was prepared, of which, he took three times a day, and once at mid-night.

℞. *Barley cleanſed* ℥j. *Roots of Snake-weed, Tormentil, Pomegranate Rinds an.* ℥ſ. *Leaves of Oak, Plantane, Sanicle, Pimpernel, Great Sanicle, Snake-weed an. one Handful. Seed of ſmall Roſes* ℥vj. *Heads of white Poppies* n° iij. *Raiſins with the Stones* ℥v. *Common Water* ℔ iiij. *Boil them to the Conſumption of the half, for an Apozeme.*

In the Hours intervening, he took often in a day a ſmall quantity of this Electuary.

℞. *Nutmegs, Trochiſchs of* Terra Sigillata, *an.* ℥ſ. *Harts-horn burnt, red Coral prepar'd, Lapis Hematitis, Maſtich. an.* ℈j. *To theſe being pulverized, add Conſerve of Red Roſes* ℥j. ſ. *Mix. cinon. Rob. Acaciæ an.* ℥iij. *Nicholas's Reſt* ℥j. ſ. *Syrrup of ſower Pomegranates* q. ſ. *Mix them for a Conditement.*

I ordered him to bear with his Thirſt as much as he could, which he the more ready yielded to; in regard, that after drinking, eſpecially of Ale, he found himſelf moſt cruelly griped, and therefore inſtead of Ale, I preſcribed him this Amygdalate for his uſual Drink.

℞. *Barly cleanſed* ℥j. ſ. *Seed of the ſmalleſt Roſes* ℥j. *Of white Poppy, Plantain and Lettice an.* ℥ſ. *Common Water* ℔iij. *boil them to the Conſumption of the Half.*

℞. *The Straining aforeſaid, ſweet Almonds blanch'd,* ℥v. *white Poppy Seed* ʒiij. *The four greater Colt-ſeeds* ʒj. ſ. *Make an Amygdalate according to Art, to which add Syrup of Poppies* ℥j. *Of Red Roſes* ʒj. ſ.

The ninth of *February* I gave him ℈iiij. of *Rhubarb* a little burnt and powdered, in a little Ale; the tenth and thirteenth I repeated the Apozeme, and the twelfth the Conditement. And thus by the uſe of theſe Medicines, the Flux ceaſing, the Patient regain'd his Health by degrees, and by the help of convenient Diet, recovered his loſt Strength: However, for a long time after his Cure, he was ill, and coveted after any ſort of Drink, which ill Habit, however afterward vaniſhed, ſo ſoon as his Guts, by the uſe of good Diet, were again fortified with new Slime, which had been corroded away by the Acrimony of the former Humors. This Patient thus cured, the ſame Diſtemper ſeiz'd three or four others in the ſame Houſe, who were all cur'd in the ſame manner.

ANNOTATIONS.

AT the ſame time, at *Montfort*, Dyſenteries were very riſe over the whole Town among the Common People, and kill'd ſeveral, which therefore many judg'd to be Malignant and Contagious; but erroneouſly, for that it was not rife, as it was contagious; but in regard of the Seaſon of the year, and the Diet then in uſe, for the Autumn of the Year before was hot and moiſt, and had multiplied many Humors in the Bodies of People; then followed a dry and intenſly cold Winter, which intenſe Cold laſted a long time with a moſt terrible Froſt, and thickned thoſe Humors. But at the beginning of *February*, that rigid Cold changed of a ſudden into a mild Warmth, by which means the Humors condenſed by the Cold, were diſſolved again and became fluid. Now during the Froſt, becauſe there was no bringing of freſh Fleſh or Fiſh, or any other freſh Diet, the Common People fed upon old Fleſh and old Fiſh, ſalted and hardned in the Smoak, Turneps, much Spice, and the like Food, that ſharpen the Humors; which being again diſſolved and rendred fluid by the ſudden Heat, occaſioned that great number of Dyſenteries; yet no where but among the vulgar People, that made uſe of ſuch a ſort of Diet; for the wealthy ſort, that eat well, were not at all troubled with the Diſtemper. Hence alſo it came to paſs, that becauſe three or four in the ſame Houſe fed alike, they had all the ſame Diſeaſe; not that the Diſeaſe was common upon the ſcore of Contagion, for then it would have infected thoſe that came to them, as well as themſelves.

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OBSERVATION XVIII.

A Dyſentery.

Pancras Collert, a ſtout young Man, about two and twenty years of age, at the ſame time alſo was ſeized with a Dyſentery, and in regard he could not endure to take Phyſic; perhaps becauſe he was very Covetous, he refuſed to take the Advice of any Phyſitians, but would needs be his own Phyſitian. He had obſerved that I was wont to purge Dyſenteries at the beginning, and therefore he reſolved to follow my Courſe in his own Diſeaſe; yet willing to ſpare Coſt, he prepared himſelf the following Purge; Tabacco ſmall cut ℥ſ. this he ſteep'd in ſmall Ale all Night; the next Morning he boil'd it a little, and ſtrain'd it, and drank of the whole Straining at a Draught. After which, he was taken with an extraordinary Faintneſs, even to Swooning, ſo that the People of the Houſe thought he would have died: Preſently followed a prodigious Vomiting, and Purging downwards, ſo that he voided an Extraordinary quantity of various Humors, eſpecially yellow and green Choler, upwards and downwards; by which means, the Cauſe of the Diſeaſe being violently and altogether evacuated, he was cured of his Dyſentery by that one Draught.

ANNOTATIONS.

SAys *Celſus*, *Oft times thoſe whom Reaſon will not recover*, *Raſhneſs helps*. This is apparent by the Example of that young Man, whoſe Raſhneſs, had any other weaker Perſons followed, they had perhaps cured their Dyſentery by the Flux of their Soul. For *Tobacco* that way taken, is a moſt vehement diſturbing Medicament, againſt the Violence of which, there is no reſiſtance. And therefore I would not adviſe all People to uſe this Experiment. If the raſh taking of ſuch a violent Medicine ſucceed well with ſome young Perſons that are of a robuſt Conſtitution, the ſame Succeſs is not to be expected in all People. Nevertheleſs, that this *Tobacco* thus taken by a very ſtrong Man, ſhould heal his Dyſentery, is no way repugnant to Reaſon; for by its extraordinary Violence, it evacuated altogether the whole Cauſe of the Diſtemper. I heard alſo, that two other country Boors, being troubled with a Dyſentery, made tryal of the ſame Experiment.

OBSERVATION XIX.

Suppreſſion of Female Purgations.

Antonia, a Plethoric Woman, very ſtrong, about three and twenty years of age, lying in of her firſt Child, riſing the third day after her Delivery, too venturouſly truſted herſelf to the cold Air; upon which, her Purgations immediately ſtopp'd, yet ſhe was well enough till the third Week of her Month, at what time a violent Pain ſeized her Right-ſide toward the Region of the Spleen, as alſo her Loyns, and extended it ſelf from the Huckle-bone to the true Ribs. The Pain had brought her very low, and taken away her Appetite; yet by her Pulſe I found ſhe had no Fever, and therefore upon the twentieth of *September*, I ordered her to be purged with this following Potion.

℞. *The beſt Rhubarb* ℥j. *Leaves of Senna cleanſed* ℥iij. *Rheniſh Tartar*, *Aniſeſeeds an.* ℥j. ſ. *Mugwort water* q. ſ. *Make an Infuſion according to Art. Adding to the Straining Elect of Hiera Picra* ℥j. ſ. *for a Potion.*

After

After this Purge, ſhe loathed Phyſic to that degree, that we muſt have here given over, but that upon the twenty ſecond of *September*, ſhe was ſeized with a violent Suffocation from her Womb; by which, the Paſſage of her Breath being ſtopp'd, ſhe was almoſt ſtifled, and ſometimes ſwooned away. Then, tormented with her Pains, and afraid to dye, ſhe promiſed to take whatever we gave her, though never ſo ungrateful to the Palate, ſo there were any Hopes of Eaſe. There to abate the Uterine Suffocation, I gave her this Decoction, of which ſhe was to take one, two or three Ounces ſeveral times a day.

℞. *Leaves of Rue, one Handful, ſeed of Lovage* ℥vj. *Down of Nuts* ℥ſ. *Seed of Caraways and Biſhops-weed* ℥j. *Decoction of Barly-water* q. ſ. *Boil them to a Pint and ſtrain them.*

By the uſe of this, the Suffocation was almoſt vanquiſhed, only the Pains of her Side more and more increaſed, and extended themſelves to her very Shoulder, ſo that I began to be afraid of her Life; therefore the twenty fourth of *September*, this Apozeme was made.

℞. *Roots of Fennel, Valerian, Stone-Parſly, an.* ℥ſ. *Of Briony* ℥vi. *Of round Birthwort, Dittany an.* ℥jj. *Of Saſſafras-wood* ℥iij. *Herbs, Mugwort, Rue, Penyroyal, Feverfew, Savine Nipp, an. Handful* j. *Flowers of Camomil, half a Handful. Seed of Lovage* ℥v. *Common Water* q. ſ. *Boil them to two Pints. In the ſtraining, ſteep for a whole Night together, Leaves of Senna cleanſed* ℥ij. *White Agaric* ℥j. ſ. *Aniſeſeed* ℥v. *In the Morning let them ſimper over the Fire, and then ſtrain them by Expreſſion for an Apozeme.*

Of this Decoction ſhe took twice a day, in the Morning, and at four or five a clock in the Afternoon, each time four or five Ounces lukewarm, which brought away every day, three, four or five times, putrid, naſty, tough, black and very viſcous Excrements, beſides an extraordinary deal of Wind. In the intervening Hours, becauſe of the Suffocations frequently returning, ſhe ſometimes took her firſt Decoction. By the uſe of theſe Medicines, within four days the greateſt part of her Pains ceaſed. The twenty ninth of *September*, I ordered the *Saphena* Vein in her Left-foot to be opened, and a good quantity of Blood to be taken away, which gave her eaſe; and the ſame day ſhe took her laſt Apozeme again, of which the following days ſhe drank no more than once a day. And thus by the uſe of theſe Remedies, ſhe eſcaped a dangerous Diſeaſe, and recovered her Health.

ANNOTATIONS.

CHild-bearing Women, in their Lyings in, frequently commit very great Errors, afterwards, the Cauſes of great Miſchiefs. Among which, this is not the leaſt, that they are over confident of their own Strength, and truſt themſelves in the Air ſooner than the time of their Lying in will permit; whence ariſe thoſe dangerous Diſeaſes, Suppreſſion of the Courſes, Fevers, Suffocations, and many others; of which, there are ſeveral Examples to be found in Authors, beſides what we ſee every day. Thus in our Practice, we have ſeen through this Error committed by Child-bearing Women, moſt terrible Diſeaſes brought upon them, ſome of whom have died, others ran moſt terrible Hazards; others have got thoſe afflictions of ſome particular Part, which they could never claw off as long as they liv'd. They do not all eſcape ſo luckily as our Patient before mentioned, for ſometimes extream Weakneſs, or loathing of the Taſte, or a Fever, or ſome other thing hinders the taking of the Medica-

Medicaments, or inverts or hinders the operation of the Medicines, and then all the Art and Diligence of the Phyſitian ſignifies nothing. Thus, the ſame year that I had this Woman in Cure, the Wife of a Kinſman of mine at *Utrecht*, a ſtrong Woman, fell into the ſame Diſtemper, but not to be cured by all the Preſcriptions of the moſt learned and prudent Phyſitians.

In theſe Caſes I have obſerved this, that the Courſes, ſuppreſſed a little after Delivery, unleſs they be ſtirred within three or four days by Medicaments, can very hardly or not at all be moved by the help of the Phyſitians, but are the Cauſes of very deſperate Diſeaſes, which Diſeaſes do not preſently appear, ſometimes not till after ſome days; ſometimes not till after the third or fourth Week. And in the Cure of theſe Diſeaſes, I have farther obſerved this, that the greateſt Relief is given at the beginning, before the Strength of the Patient is abated, partly by attenuating Apozems, and looſning withal, to provoke and evacuate the Matters peccant, both in quantity and quality, partly by Blood-letting in the Feet; which way of Cure, I have with ſucceſs experienced more than once.

OBSERVATION XX.

The Nephritic Paſſion.

THE Young Lady *Calſlager* was ſo cruelly tormented for three days, with a Pain a little below her Loyns, that ſhe knew not where to turn her ſelf; theſe Pains were alſo accompanied with Vomiting, and an extraordinary Reſtleſſneſs. It was the Nephritic Paſſion, and the Gravel or Stone deſcending through the Ureters, cauſed this Pain: Wherefore, to expel the Gravel with more ſpeed and eaſe, I preſcribed this Decoction.

℞. *Slic'd Licorice* ℥ſ. *Herbs, Stone-parſly, Althea, Chervil, Mallows, Water-parſly, Leaves of black Ribs an. one Handful, Flowers of Camomil, one Handful and a half, fat Figs* n° ix. *New Milk, common Water, an.* q. ſ. *Boil them to the Conſumption of the third part for an Apozem.*

That Day ſhe drank almoſt all the Decoction, and about Evening, voided ſome ſmall Stones, with a good quantity of Gravel, and was freed from her Diſtemper.

ANNOTATIONS.

MEdicines that break the Stone, ſometimes crumble the little Stones that ſtick in the Kidneys, as Experience tells us. But when they are expell'd out of the Kidneys, and ſtick in the Ureters, they are not to be crumbled by the force of any Medicaments whatever, which Reaſon, beſides Experience, teaches us, ſince no Medicaments can reach thither with their Vertue entire; for that the great quantity of *Serum* running thither, and there ſetling, hinders and abates the Strength of the Medicaments; ſo that they are diſabled in their Operation. And therefore, to force the Stones out of the Ureter, lenifying and molifying Medicaments muſt be mixed with the Diuretics, to ſmooth and mollifie the Ureters, and to prepare a more eaſie Deſcent for the Stone. Such is that Decoction which I, and ſuch is that Preſcription of *Jo. Baptiſt Thodoſius*, which he, boaſt never fail'd him in driving out the Stone, though he had made uſe of it ſeveral and ſeveral times.

℞. *Leaves of freſh gathered Althea one Handful and a half, New Butter* ℥iij. *Honey* ℔ j. *Boil them together in Water* q. ſ. *to the Conſumption of the third part. Take of the Straining a warm Draught Morning and Evening.*

Such is alſo that celebrated Secret of *Foreſtus*, which moſt Phyſitians highly approve, and which I have ſucceſsfully made uſe of, only now and then with

ſome Alterations and Additions; of which, *Foreſtus* himſelf thus writes. *This, my Secret, I will no longer conceal, for the common Benefit of the Sick; that it may not be laid to mine, which was laid to the Charge of the wicked Servant, who hid the Talent, which God had given him, in the Earth.* And therefore I will no longer, to the Prejudice of Poſterity, keep this Secret by me, which is this.

℞. *Seed of Mallows, Althea an.* ℥iij. *Red Vetches* ℥iij. *The four greater Seeds an.* ℥ij. *Barly cleaned* ℥ij. *Fat Figs* n° ix. *Sebeſton* n° vij. *Licorice ſlic'd* ℥j. *Rain-water* ℔ iiij. *Boil theſe to the Conſumption of half, and reſerve the Straining for uſe, which the Patient continually uſing, always voided Stones.*

OBSERVATION XXI.

The Worms.

A Little Boy, the Son of *Antonius*, about three years of age, had the lower part of his Belly extreamly ſwell'd, and ſtretch'd like a Drumb, ſo that he ſeem'd to be Hydropic; his Stomach was gone, with a ſlight Fever, accompanied with Frights in his Sleep, and he would be always rubbing his Noſe with his Fingers. I gueſs'd them to be either Worms or crude Humors ſticking in the firſt Region of the Belly, that cauſed all thoſe evil Symptoms. Wherefore, becauſe the Child would take nothing, but would be always drinking, I ordered new Ale to be given him for his Drink, with which I only mixt a little Oyl of Vitriol, ſo much as ſuffic'd to give it a gentle Sowrneſs. This Drink being continued for a fortnight or three Weeks, the Swelling of his Belly fell, but he voided no Worms.

ANNOTATIONS.

OYl of Vitriol given after that manner, does not only remove all Putrefactions and Corruptions, but kills and conſumes the Worms in the Stomach and Guts, and thoſe that are infeſted with ſuch like evils; and we have ſeen it recover thoſe that have been deſpaired of, contrary to Expectation. Thus my Siſter *Cornelia*, when ſhe came to be ſeven years of Age, and was miſerably tormented with the Worms in her Belly, and had taken ſeveral Remedies to no effect, when ſhe was deſpaired of, and nothing but Death expected, at length, by taking Oyl of Vitriol given in Ale, ſhe was recovered in a ſhort time. The ſame thing happened to *Margaret Dobre*, the Daughter of the Marſhal of *Montfort*, and ſeveral others. Therefore it is not without reaſon that the Chymiſts cry up this Oyl ſo highly as they do. Concerning which, and the Oyl of Sulphur, *Mindererus* thus writes, *There is no Corruption, the Strength of which they do not break*; no Infection which they do not overcome, no depravation of Humors, which is not vanquiſhed by them.

OBSERVATION. XXII.

A Burning.

PEter *Abſtee*, going to ſhoot off a Muſquet, by chance the Breech of the Gun broke, and though the Splinters of the Iron did him no harm, yet his Face was all over burnt with the Flame of the Powder, and ſeveral of the Corns of Powder ſtuck in his Skin. The Corns being preſently pick'd out, we apply'd to his Eyes, Linnen Rags doubled and dipp'd in very Salt Butter; and over his Face we lay'd raw Turneps bruis'd in a Mortar with Salt Butter, which we

we chang'd thrice the firſt day, and once the next night. This Cataplaſm drew out the Fire remarkably, nor did any Bliſter riſe upon his Eye-brows, which the Butter had prevented; ſo that after one or two Anointings afterwards with Oyntment of Roſes and Pomatum, he was perfectly cured.

ANNOTATIONS.

IN a Burn, the greateſt Care to be taken, is to fetch out the Fire, and to prevent the riſing of Puſtles and Bliſters; for the effecting of which, various Remedies are commended. In a ſlight Burn, the Cure is perfected by holding the Part which is hurt to the Fire, or by putting it into hot Water, or Water as hot as you are able to endure it. But Burns of more Concernment, raw Turneps beaten with Salt, are a moſt certain Remedy, by which, I have done ſtrange things in very terrible Burns. *Common People*, ſays *Pareus*, *find by Experience, that the Heat of the Part ſlightly burnt, vaniſhes, and the Pain ceaſes, if they hold the Part affected to the Flame of a Candle, or to quick burning Coals; for Similitude cauſes Attraction. Therefore the outward Fire draws out the inner, and ſo Fire becomes the Cure of the Miſchief which it cauſed. It is alſo a try'd Remedy, and eaſie to be had, if preſently after the Burn, you clap raw Turneps bruiſed with Salt to the part aggrieved.*

Nevertheleſs, *Hildan* ſays, that Turneps do not agree with Burns in the Face, becauſe they prejudice the Eyes, which would be true, if the Turneps were put into the Eyes; or if the Eyes, before the Application were not guarded with other things, which we think is beſt done with Linnen Rags four doubled, and dipp'd in very ſalt Butter; for that the Salt Butter draws out the Fire, by reaſon of the Salt; and by its fatneſs, lenifies and guards the Eye-lids. But diſtill'd Waters are far leſs convenient, as are alſo Woman's Milk, or Whites of Eggs, or any ſuch like things, which are preſently dry'd up, and ſtick ſo cloſe to the Part affected, that they can hardly be pull'd off without excoriation. In Burns of the Face, *Hildan* rather uſes this Oyntment.

℞. *Venetian Soap* ℥j. *Oyl of Sweet Almonds and Roſes an.* ℥ſ. *Muſcilage of the Seeds of Quinces extracted with Roſe-water, a ſmall quantity. Mix them for an Oyntment.*

In other Parts, he writes, the following Oyntment powerfully draws out the Fire.

℞. *Raw Turneps* ℥j. ſ. *Salt. Venice Soap, an.* ℥ſ. *Mix them in a Mortar, and make an Oyntment with Oyl of Roſes and Almonds.*

Beſides theſe, there are many other things which powerfully draw out the Fire. Among the reſt, Writing-Ink, as we have already ſhewed, and Pickle, Linnen Rags being dipped therein, as alſo Lime-water do the ſame. Concerning Pickle or Brine, *Lemnius* thus writes, *Pickle or Brine, by a preſent and peculiar force, draws the Fire out of Burns, and aſſwages the moſt intenſe Pains, whether the Burns be of Gun-powder, or the Scaldings of Oyl, Pitch, Scalding-water, or fiery Coals; eſpecially if the Parts affected be but fomented with a Rag dipped in the Pickle*; this is confirmed by *Matthias Paczerus*. Butter alſo mixed with a great deal of powder'd Salt, and laid upon the Scald, does Wonders. But theſe things are to be uſed at the beginning, before the Wheals and Bliſters riſe, and that there be any Excoriation, elſe theſe things are not ſo proper, but the Cure muſt be ordered another way.

OBSERVATION. XXIII.

The Tooth-Ach.

CO*rnelia Jacobi*, a ſtrong Woman, was troubled with a terrible Pain in the Teeth, together with a Pain in half her Head; whereupon I gave her this Vomit.

℞. *Glaſs of Antimony powder'd* gr. xii. *White-wine* ℥v. *Let them ſteep all Night, in the Morning filter the Wine through a Sheet of brown Paper, and give it for one Draught.*

This brought up Choleric, Flegmatic and tough Matter in abundance; and beſides ſhe had ſome Stools; the next Night ſhe ſlept well, the Pain of her Teeth ceaſed, and ſhe never had it more.

OBSERVATION XXIV.

The Gallic Fever, Epidemic.

IN the Year 1635. the Summer was extream hot and dry; at what time, the King of *France*'s Army being joyned with ours, beſieg'd *Lovain*, where the Souldiers were in great want of all things, eſpecially of Bread and Water, and for that reaſon they fed upon the Fruits of the Seaſon, unripe and crude, Fleſh newly kill'd and never ſalted, without Bread, and other Food that bred ill Nouriſhment; ſo that at length, almoſt conſumed with Hunger and Thirſt, they raiſed their Siege, and by reaſon that *Schenk-Fort* was at that time betray'd into the *Spaniards* Hands, they were forced to come into our Country. Hither when they came, beſides our own, the greateſt part of the *French* Foot quartered for ſome time at *Nimeghen* (where I liv'd at that time, and began to practiſe) and among thoſe Souldiers, a certain Peſtilent and Malignant Fever began to be very rife ſome few days before their coming to the Town. Here the Souldiers overjoy'd, found Plenty of all things, and were well refreſh'd; but within a few days this malignant Fever ſwept away great Numbers of the whole Army, more eſpecially of the *French*; for not to reckon our own, within two or three months this dire contagion laid in their Graves, at leaſt three thouſand of the *French* at *Nimeghen*; nor did it rage leſs in the Camp before *Schenk Sconce*, and in other places it made the ſame Deſtruction, both of our own and the *French* Souldiers, and from them the Infection ſpread it ſelf among the Citizens and Inhabitants at *Nimeghen*, where above a thouſand were devoured by the Earth in a few months. Nor was the Havock leſs among the Inhabitants of the adjoyning Cities; nay, it penetrated even into the very Heart of our Country. Now, becauſe this Fever firſt infected the *French*, and afterward the reſt, it was generally called the *French Fever*, and by many alſo the *Gallic Diſeaſe*.

There is not a ſmall Contagion in this Diſeaſe, which is chiefly communicated to others by Contact and Attraction of putrid and moſt naſty Vapors, of Sweat, of Ordure, *&c.* and therefore they who attended the Sick, or ſtaid any while with them, were ſure to be infected with the Diſtemper; but the Contagion was firſt ſpread all over *Nimeghen*, more eſpecially for this reaſon; becauſe the whole City, by reaſon the Army was ſo vaſt, was all full of Souldiers, inſomuch that all the Streets and Lanes were fill'd with Souldiers, ſome in Health, and ſome ſick, lying every where at the Sides of the Streets: and hence the Filth and Excrements, as well of the Sick as Healthy, were thrown into the publick Paſſages in great Heaps; nor was there any avoiding them, becauſe of the extraordinary Multitudes of People paſſing to and fro. And thus it came to paſs that the malignant and corrupt Vapors riſing from thoſe naſty Dunghills, infected the whole City with Contagion and Diſeaſe.

The

The Cauſe of this Diſeaſe did not lye ſo much in the malignant Corruption of the Spirits, as of the Humors, and therefore it might be very properly call'd a Peſtilence in the Humors; but it differed from the Peſtilence in this, that in the Peſtilence, the vital Spirits, in this Fever, the Humors, are corrupted after a malignant manner. Moreover the Contagion of the Peſtilence hangs in the Air, and infects more at a diſtance; but the Contagion of this Fever is communicated by the Immediate Contact and Attraction of malignant Vapors. Laſtly, the Peſtilence is a Diſeaſe more acute and dangerous, and of which more die than eſcape; but in this Diſeaſe more eſcape than dye.

This Fever, at the beginning ſeiz'd ſome ſharply, but moſt People gently; ſome without, and others with a ſlight Cold and Shivering. A little after the beginning, in many followed a very great Heat, accompanied with a vehement Thirſt; which Burning ſometimes intermitting by ſlight Intervals, continued for the moſt part till the ſeventh day or longer. In many alſo this intenſe Heat was not perceived; and in ſuch Perſons the Heart was more affected by the malignity of the Humors than the heat, for in them the Vital Faculty was more endammag'd. At the beginning of the Diſtemper, there appeared a very great Debility and Diſſipation of the natural Strength. Deliriums in ſome, in moſt Faintneſs, in many Head-achs and want of Sleep; in all Thirſt, with a great drineſs of the Tongue; many alſo preſently after the Diſeaſe, were troubled with malignant *Dyſenteries* and *Diarrhea*'s, very difficult to be cured. The Pulſe was alſo very thick, but weak and unequal.

Upon the days of *Criſes*'s, the Patients were generally worſe, nevertheleſs very few *Criſes*'s that were good. Nature ſeemed to endeavor and attempt *Criſes*'s; but in regard of the great quantity of malignant Humors, and the waſted ſtrength of the Patient, ſhe was not able to accompliſh them. *Criſes*'s, by Sweat or bleeding at the Noſe, or coming down of the Courſes, ſometimes alone vanquiſh'd the Diſtemper, but very ſeldom; for they were for the moſt part imperfect, but by looſneſs of the Belly they were dangerous, and to many mortal. In ſome, little red Spots breaking out over all the Body upon the Skin, chang'd the Diſeaſe ſometimes for the worſe, and ſometimes for the better. Some that lay long ſick had critical Abſceſſes in ſome ſound part. But Carbuncles never appeared. I never ſaw any that had either Kernels in their Groins, behind their Ears, or under their Armpits, or that Nature ever voided any thing through thoſe Emunctories.

Some that had been cured of this Fever, eaſily relapſed into as dangerous and mortal a Diſtemper, eſpecially if they expoſed themſelves abroad too ſoon, or committed the leaſt Error in Diet.

In the Cure of this Diſtemper, the primary and chief Relief was given by Blood-letting three or four times, and in ſome ſix or ſeven times repeated. I have ſeen *French-men*, whom their Phyſicians have let Blood in four days ſpace, no leſs than twelve times, and have taken great quantities of Blood from them; for the Patients found great Eaſe after Blood-letting; and becauſe ſo known a Remedy, at length, that many, without the Advice of a Phyſician, would order themſelves to be let Blood, by which means, ſome cured themſelves of their Diſtemper. More than that, this ſeemed a greater Wonder, that when Blood-letting decays the Strength ſo much, yet in this Diſeaſe, after great quantities of Blood taken away, Nature gathered new Strength, and was relieved from the burthen of malignant Humors; and all the

Patients,

Patients, even they that were in the weakeſt Condition, were able to endure Blood-letting. Theſe Fevers ſubmitted to no Remedies ſo eaſily as to Blood-letting. The Blood which was drawn forth for the two or three firſt times, was very Corrupt in all Men. Nor do I remember that among all thoſe Multitudes of Sick People I ever ſaw one that had good Blood taken from him at the beginning: but for the moſt part whitiſh, often between livid and greeniſh, wherein there was a little mixture of red Blood. It was Muſcilaginous like the Decoction of Calves-feet. In moſt it was Coagulated: In ſome alſo it would hardly Coagulate, the Fibres being for the moſt part conſumed by the Corruption; and thoſe were in moſt danger. After the third or fourth Bleeding the Blood prov'd tolerable.

Being call'd therefore to Patients, after looſening the Belly with a Glyſter, we order'd Blood-letting as ſoon as poſſibly we could; and if the Patients ſtrength would permit, we repeated it the next day; taking away every time from half a pint to a pint of Blood, and the ſame we did again after three or four days intermiſſion, according to the ſtrength of the Patient and the exceſs of the Fever. Nevertheleſs in the mean time we Adminiſter'd Purging Medicines, and ſometimes Glyſters to keep the Body open, and becauſe there was a Malignity in the Diſeaſe we made frequent uſe of Diaphoretics and Antidotes, Juleps, and Cooling and Cordial Electuaries were very Beneficial, mix'd with Diuretics, more eſpecially if they were oppoſite to the Malignity. When the Patient could not ſleep, we anointed his Temples with ſome gentle Opiate, and gave him ſometimes Narcotics to ſwallow.

ANNOTATIONS.

MAlignant and Peſtilent Fevers how they may be allowed without a true Peſtilence, we have ſhown at large in our Treatiſe of the Peſt. But theſe Fevers are various, as not proceeding always from the ſame Cauſe, nor ſeizing the ſame manner, nor admitting the ſame Cure. Sometimes the Infection of the Air alone, ſometimes extraordinary Corruptions of the Air by bad Dyet, or otherwiſe, ſometimes hurtful Exhalations of things Corrupt and Putrid: ſometimes diſpoſitions of the Temperaments of the Air and Bodies; either ſingle of themſelves, or ſome or all of them conjoyned together, create theſe Epidemic Fevers, and therefore as the Cauſes are various, ſo is there great varieties in the Cure. And therefore it is that theſe malignant Fevers ſeldom appear twice altogether one like another. *Fracaſtorius* deſcribes a Peſtilential Fever, which differed very much from ours, which came from a certain Infection of the Air, and chiefly prey'd upon the Spirits, and not upon the Humors, and was chiefly cured with Antidotes; whereas Blood-letting did harm: On the other ſide, our Fever more an Enemy to the Humors then the Spirits, was cured by Blood-letting. *Wierus* makes mention of a Malignant and Peſtilent Fever, which was very riſe about the Countries lying upon the *Rhine*, and very different from ours, which the Cure informs us: for he writes, that he found Blood-letting very dangerous. From our Fever alſo differ very much thoſe Fevers which *Foreſtus* deſcribes, wherein there were neither the ſame Symptoms, neither would the Cure admit repeated Blood-letting. *Lazarus Riverius* produces one Example of a Malignant Fever, which in many Patients agreed with ours, and was cured by five times Blood-letting. To which there was one very like that we ſaw in *France* in the year 1632 already mentioned, *Obſerv.* 3. But that it may be the better underſtood. How Patients afflicted with this ſame Malignant Fever are to be ordered, I ſhall produce one or two Examples of a thouſand in the following Obſervations.

OBSER-

OBSERVATION XXV.

A Malignant Fever.

HErman *Thomas*, a Baker, was ſeized with the foreſaid malignant Fever the fifth of *September*, with a very great Heat and Conſumption of his Spirits; at the beginning, his Pulſe beat thick, yet not very unequal; this Thirſt was vehement, with a very great drineſs of the Tongue. All the Body ſeem'd to be equally affected, and therefore he never felt any Pain, only complained of a great Faintneſs and Dejection of his Heart, the firſt day coming to him about the Evening I ordered him an Emollient Gliſter, which gave him three Stools, and to quench his Thirſt, I preſcribed him this Julep.

℞. *Carduus water, Borage and Sorrel water an* ℔j. *Juice of Citron newly ſqueezed out of the Fruit, Syrrup of the ſowre part of the Citron, of Violets, Rob of red Ribes an.* ℥. *Oyl of Sulphur* q. ſ. *to make it gratefuly ſharp mix them for a Julep.*

The ſixth of *September* in the Morning we took away a pint of Blood out of the Median Vein of the right Arm; which gave him great eaſe. The Blood was very bad, the upper half between livid and green, and like a Muſcilage, the lower half black and coagulated; the Serum alſo was Green. The next day he felt a Pain in his Throat, which was without any Tumour, for the aſſwaging of which, I ordered him a proper Gargariſm. In the Morning he took a gentle Purge which gave him five Stools. To quench his Thirſt he took ſmall Ale, and ſometimes his Julep: the eight of *September* his Fever continuing in the ſame ſtate, we took away ten Ounces out of his left Arm, which was as bad as the firſt: the ninth this Sudorific was given him.

℞. *Diaſcordium of Fracaſtorius* ℥j. *Confection of Hiacinth, Extract of Carduus, Salt of Rue an* ℈j. *Treacle and Carduus water an.* ℥j. *Oyl of Vitriol* ix. *drops, mix them for a Draught.*

Upon this he ſweat well; nevertheleſs the Continual Fever, his weakneſs, his Pain in his Throat, his Thirſt and drineſs of his Mouth continued ſtill; beſides that he could not ſleep hardly at all. Therefore in the Afternoon he drank two Draughts of the following Apozem, and took it alſo the next day.

℞. *Roots of Succory, Graſs, Aſparagus an.* ℥j. *of Elecampane, Sea Holly, and ſtone Parſley; an.* ℥ſ. *Herbs, Sorrel, Carduus Benedict. Borage, Centaury the leſs, Scordium, Scabious an. one handful. One whole Pome Citron cut in ſlices, the four greater Cold-ſeeds an.* ℥j. ſ. *Fruit of Tamarinds, Rheniſh Tartar an.* ℥vj. *Curants* ℥j. ſ. *Boyl them in common water* q. ſ. *to* ℔ ij. *add to the ſtraining Syrup of Limons* ℥iij. *mix them for an Apozem.*

The eleventh, after an Emollient Gliſter firſt given, we took away ſeven

ſeven Ounces more of Blood out of his right Arm, which very much abated the Fever; the twelfth, after he had taken his former Antidote in the Morning, he Sweat very much: and in the Afternoon he took his Apozem. The next day becauſe his Belly did not anſwer our Expectations I gave him this Powder to take mixed with a little of his Julep, which gave him three Stools.

℞. *Rhubarb the beſt* ℥j. *Cremor Tartar* ʒ ſ. *for a Powder.*

This Powder he took again the ſixteenth in the Intervening days, and the three days following he took the foreſaid Apozem and a ſmall quantity of this Conditement.

℞. *Pulvis Liberans* ℥j. ſ. *the three Saunders* ℈ij. *Confection of Hyacynth* ℈j. ſ. *Candy'd Orange Peels, Rob of red Rils Pulp of Tamarinds an.* ʒ ſ. *Syrup of Limons* q. ſ. *mix them for a Conditement.*

Upon the twelfth his Fever abated every day more and more, neither was he moleſted any more with Anguiſh or Thirſt; but his Stomach began to come to him; but then through a ſlight Errour in his diet, he fell into a Relaps, and his Fever returned with great violence: Therefore after we had Gliſtered him firſt, we took half a pint of Blood out of his left Arm, which gave him ſo much eaſe that the Fever was almoſt totally quenched with that one Blood-letting. The next Morning taking his Antidote again, he Sweat ſoundly, and then taking his Apozem and his Conditement, both that day and the three or four next days, he was preſently delivered from his Fever. During the Cure we kept him to a ſlender diet of Broths, wherein were boil'd Sorrel, Borage, Pome Citrons, Barley cleanſed and unripe Grapes. To drink we gave him ſmall Ale, and ſometimes Juleps, and ſometimes he quenched his Intollerable Drought with Pulp of Tamarind, or by chawing a ſlice of Pome Citron dipped in Sugar: or elſe by laying upon his Tongue a Leaf of the bigger *Sempervivum*, ſteeped in water, and the outer Skin pulled off.

OBSERVATION. XXVI.

A Malignant Fever.

Gertrude Coets, a Young Maid of about twenty four Years of Age, was ſeized with the ſame Peſtilential Fever. Upon the eight of *September* I being ſent for (which was the fourth day of the Diſeaſe,) I found her ſo weak that ſhe could hardly ſpeak; ſhe ſwoonded away every moment, by reaſon of the Malignant Vapours that oppreſſed her Heart; her Pulſe was very weak, thick and unequal: the heat not very intenſe, in regard the Morbific Matter infeſted her more by it's Malignity then it's Heat; preſently I gave her this Sudorific.

℞. *Oriental Bezoar ſtone* ℈ ſ. *Diaſcordium of Fracaſtorius, Mithridate Damoc. Confection of Hyacinth an.* ℈j. *Carduus water* ℥j. *mix them for a Draught.*

Though

Though ſhe did not ſweat long, by reaſon of her weakneſs, yet ſhe had very much eaſe; to quench her Thirſt, I preſcribed her this Julep.

℞. *Carduus, Baum, Sorrel and Scabious waters an.* ℔ß. ſ. *Cinnamon* ℥j. *Citron juice newly ſqueezed* ℥j. ſ. *Syrrup of Limons, Violets an.* ℥j. ſ. *Oyl of Sulphur* q. ſ. *mix them for a Julep.*

The ninth her Belly was moved by a Suppoſitory: and two hours after we took from the Median Vein of her right Arm half a pint of Blood, which was very corrupt, Muſcilaginous, between Pale and Greeniſh, with a green Serum containing a little good Blood at the bottom, notwithſtanding the great Conſumption of her ſtrength ſhe endured her Blood-letting very well, which gave her great eaſe; ſhe alſo often took a ſmall quantity of this Conditement.

℞. *Pulvis Liberans.* ℥j. *Salt Prunella* ℈j. *Rob of red Ribes, Pulp of Tamarinds, Conſerve of Roſes. an* ℥ſ. *Confection of Hyacinth* ℥j. ſ. *Syrrup of Limons* q. ſ. *mix them for a Conditement.*

The next day ſhe continued the ſame Medicins; and for her ordinary drink ſhe drank ſmall Ale with ſome few drops of Oyl of Vitriol. The eleventh of *September* ſhe took again her laſt Sudorific, and found ſome eaſe by it. The twelfth her Anguiſh and Weakneſs ſeemed again to increaſe; wherefore we drew ſix Ounces of Blood out of her left Arm; which was as bad as the former. This Blood-letting gave her very great eaſe, I would willingly have preſcribed her Apozems and ſome other things, but becauſe ſhe was nice, and had a very nauſeous Stomach by reaſon of her Diſeaſe, ſhe could take nothing. The thirteenth we mixed ℥j. of Rhubarb Powdered and ℥ ſ. of Cremor Tartar, in a little ſmall Ale and deceived her, which gave her three Stools; the next day ſhe was much better, and taking the foreſaid Conditement, her Fever became very remiſs. The eighteenth ſhe relapſed into an extraordinary weakneſs; then I ordered her this mixture in a Spoon, which ſomewhat releived her.

℞. *Oriental Bezoar ſtone* ℈ ſ. *Confection of Hyacinth.* ℈j. *Cinamon-water* ℥j. *Carduus-water* ℥ij. *mix them.*

The nineteenth we again drew out of her right Arm five Onnces of Blood; which very much abated her Fever that day and the next day, ſhe continued the uſe of her Conditement and Julep; at this time *D. Gilbert Coets* cheif Phyſitian of *Arnheim*, was called to conſultation who recommended for a try'd and moſt proper Remedy his own Treacle-water, which he called Carbuncle-water, and concealed as a great Secret; by his advice one Spoonful of this water was given twice or thrice a day to the Patient; but the twenty firſt her Fever growing more upon her, I gave her this Antidote.

℞. *Salt of Worm-wood, Confection of Hyacinth an.* ℈j. *Oriental Bezoar* gr. xii. *Carbuncle water, Carduus water an.* ℥ ſ. *mix them.*

This was again repeated the twenty ſecond and twenty third, the twenty fourth by the help of a Suppoſitory ſhe had a Stool; in the Evening ſhe took this,

℞. *Bezoar ſtone Oriental* gr. xii. *Pearls prepared* ℈j. *Carbuncle water* ℥ ſ. *mix them and give a Spoonful at a time.*

The next day ſhe ſwallowed xii. grains of *Pill. Ruffi* in two Pills; which toward the Evening gave her two Stools. The twenty eight of *September* ſhe took them again as alſo upon the ſecond of *October*, in the Intervening time ſhe continued the uſe of her Conditement, Julep and Cordial-water, and fed upon Broths, and thus ſhe was reſtored to her former Health.

OBSERVATION XXVII.

A malignant Fever.

Henry ter Koelem, being taken with the ſame Malignant Fever, the fourth of *September* ſent for me, I found him full of Anguiſh and weak; his Pulſe weak and unequal, yet without any intenſe heat; we let him thrice Blood, us'd proper Gliſters, looſening Medicaments, Sudorifics, and ſuch as reſiſted Corruption and Malignity, together with other Cordial Remedies, and ſo recovered him. But going abroad too ſoon, and being careleſs of his diet upon the twenty eight of *September* he relapſed into a more dangerous Fever then his firſt. After twice letting Blood, and ſeveral other Medicaments exhibited, red Spots, and ſome Purple ones came forth over all his Body upon the Skin, upon which the Fever went off, and within eight days he recovered much of his ſtrength; but then ignorant of his weakneſs and truſting too much to his ſtrength, upon the twenty eight of *October* going but once a little abroad, he fell into a ſecond Relapſe more dangerous ſtill: by reaſon of his ſtrength debilitated by his former Sickneſs. The Fever harraſs'd his Body already much weakened, with great violence, nevertheleſs after Blood-letting, we gave him ſeveral Remedies with that ſucceſs, that at length upon the tenth of *November* he fell into a very great Spontaneous Sweat; but as he lay in his Sweat; a certain Ruddy Tumour began to appear in his left ſide, above the fifth, ſixth, and ſeventh Rib; which the next day bunched out as big as a Man's Fiſt. Thus the Fever went off, and the Criſis of the Diſeaſe was performed by Sweating and an Impoſtume; but the Tumour was very hard, which becauſe we could not bring to a head in five days with mollifying and ripening Cataplaſms; and for that the Party complained of the Pain of the inner part affected, I was afraid, leaſt ſome matter ſticking between the Ribs near the *Pleura* Membrane ſhould have already ripened, which might occaſion ſome greater Miſcheif, ſhould the Impoſtume break within, before the outward Maturation, and ſo the Matter fall down to the inner parts, to prevent this Inconvenience though I could neither ſee nor feel any ſign of outward Maturation, I ordered a Chyrugeon to open the Tumour half a Fingers breadth above the Ribs, which done, it appeared that my judgment had not failed me for there came forth at the ſame time matter both white and Mature; and thus the Patient eſcaped the danger threatened by the Impoſtume,

to

ſo that ſo ſoon as the Tumor was cured he recovered his former Health.

OBSERVATION XXVIII.

A malignant Dyſentery.

AT the ſame time that the foreſaid Malignant Fever ſo cruelly raged, Malignant Dyſenterys fatal to many, were very rife, after they had voided the ſlime of the Guts, they preſently voided Blood, not alone and pure, but mixed with a certain white, Viſcous and Tenacious Humour; which like Pitch or Bird-lime ſtook cloſe to every thing it touched; and might be drawn out into long ſtrings. The Patients were cruelly griped in their Bellys; and beſides a continual Fever, Anguiſh of the Heart, extream Weakneſs, vehement Thirſt, loſs of Stomach, want of Sleep, and ſomething of heat in the Urine were the Concomitants of this Diſtemper; and as for them that voided that viſcous and white ſlime, mixt with Bloody Dejections, if it were very tough, the moſt of thoſe People dy'd; and the leſs tenacious it was, the better they eſcaped. They who brake wind during Exoneration, gave great hopes of recovery. They that were converſant with the Sick or tended upon them, were infected with the contagious Stench of the Diſeaſe; theſe Fluxes were very difficultly cured, in regard that Blood-letting avails nothing in the cure; and many times neither Purges nor Aſtringents, nor Sudorifics nor other Remedies uſually adminiſtered in this Diſtemper were given with any ſucceſs.

ANNOTATIONS.

THIS ſame Contagion, at this very time carry'd off vaſt numbers of our Men in the Camp before *Schenk*-Fort. And when the Phyſitians to the Army had try'd all the Remedies they could think of for the Cure of this Diſtemper, but very few did any good, at length there was a Remedy found out by certain *Italian* Phyſitians, who came hither with the *French* Army, by which afterwards great numbers were cured. Firſt they Purged the Patients with Rhubarb. Then they took white Wax ʒ j. ſ. or ʒ ij. and cut this very ſmall into ʒ iiij. or v. of New Milk, which they boil'd till the Wax was perfectly melted, and then gave their Patients that Milk as hot as could be to drink; for it muſt be taken very hot, becauſe of the Wax, that elſe would thicken, ſo that it could not be drank; if the Lask did not ſtop the firſt time, then they gave it a ſecond and a third time. But in regard there were a great number of Souldiers that lay ſick of this Diſtemper, there was ſuch a vaſt quantity of white Wax conſumed in a ſhort time, that the Apothecaries of *Emeric* were quite exhauſted; ſo that they were forced to ſend for it to other Places. Now though Wax ſeldom is given to ſwallow, yet it is no new thing. For *Diaſcorides* writes, that it is of great Efficacy to fill up wounds, and is given in Broths to thoſe that are troubled with Dyſenteries. Thus *Valleriola* ſpeaks of a Dyſenteric recovered by ſuch a Remedy. He cut an Apple hollow, and filled it with Citrin coloured Wax, and then covering it laid it in the Aſhes to roaſt, till the Wax was melted and mixed with the ſubſtance of the Apple, and then gave it the Patient faſting to eat for ſome days together; though he believes it better to roaſt and melt the ſaid Wax in a Quince, as being more aſtrictive and glutinous. *Quercetus* prepares the ſame Remedy by cutting an Apple hollow, and filling it with white Wax and Gum Arabic *an.* ʒ j. *Solenander* ſtuft a Turtle with an Ounce of white Wax, and boyl'd it in Water, and then gave both the Fleſh and the Broth to be eaten with Bread. Others preſcribe a Young Pidgeon ſtuft and boiled after the ſame manner.

OBSERVATION XXIX.

A Dyſentery.

Marcellus Bor, a ſtrong Man of about forty Years of Age, was taken with a Dyſentery of the ſame Nature. The ninth of *October* I Purged him with Rhubarb, then I gave him Juleps, Conditements, Powders cooling, thickning and Aſtringent Apozems, Sudorifics and other proper Medicaments in convenient manner and time; ſo that the Patient being reduced to extremity of weakneſs I began to give him over, not beleiving he could live two days in that condition, but in regard he was very thirſty and called for cold Water, I ordered in a deſperate condition that he might have as much cold water as he would drink, to the end that by drinking ſuch a quantity of water, the Morbific cauſe, if it were poſſible, might be waſhed off from the Guts, and the Acrimony of it blunted by the force of the cold. All that Night the Patient drank as much as he would of Well-water; which at firſt paſt ſwiftly through his Guts and with wonderful griping flowed down to the lower parts; afterwards not griping ſo much, toward Morning the Pains of the Guts were almoſt ceaſed, and the Stools leſs frequent; about noon the Patient falling a ſleep, ſlept quietly for ſome hours, before the Evening the Flux ſtopt, and ſo the Patient refreſhed with proper diet, when every one thought he could not have lived, was unexpectedly recovered from a moſt deſperate Diſeaſe.

ANNOTATIONS.

CONcerning the Drinking of cold Water in a Dyſentery, there are hardly any of the Modern Phyſitians that ſpeak a word. Yet it is a Remedy not improper in a Choleric Dyſentery: For it waſhes the Inteſtines with its moiſture, and frees them from all the filth of ſharp Humors, and cleanſes the inner Ulcers. By its coldneſs alſo it abates and dulls the Heat and Acrimony of the Choler; and binds up the Exulcerations of the Inteſtines. Nor was the Drinking of cold Water unknown to the Ancients in this Diſeaſe. Therefore ſays *Ætius*, *at the beginning, for drink, uſe Rain-water; but if there be no good Rain-water, take Fountain-water.* *Celſus* alſo writes in theſe words, *If after ſeveral days tryal, other Remedies will not prevail, and the Diſeaſe is come to be of ſome continuance, the drinking of cold Water binds the Ulcers.* In like manner *Paulus* and others of the Antients make mention of the drinking of cold Water in a terrible Dyſentery. Among the Moderns *Amatus* of *Portugal*, was one that by his own report, ſaw a Choleric Dyſentery cured by the drinking of a great quantity of cold Water.

At other times it alſo happens, that when the beſt Medicines avail nothing, a plain ordinary Medicine has cured moſt deſperate Dyſenterys. So by the Relation of Captains I have heard, that when *Breda* was beſieged by the *Spaniards*, and that Dyſenteries were very riſe in the City, nor any Remedy could be invented for this Diſtemper, when all the known Remedies of the Phyſitians fail'd; at length a new invention was found out, by which many were cured. A piece of Silk double dy'd of a deep Crimſon colour, comb'd into ſlender Threads and ſteep'd in Wine; this taken in Wine with a dram or half a dram of Powder of the ſame Silk for ſome times, infinite numbers have been cured by it. I know a certain Dyſenteric Perſon who was given over, who upon eating a vaſt quantity of Medlars, recovered beyond all expectation. Another was freed by Man's Bones drank in red Wine, of a Flux which was thought incurable. Oyl of Olives taken alone, or eaten with a White

a White-bread Toaſt dipp'd in it, many times works wonders. *Holler* affirms, that he was cured ſeveral times with the Juice of Ground-Ivy. *Foreſtus* writes, that he never found any thing more prevalent, then the Dung of Dogs that only fed upon Bones given in Chalybeate Milk. And with this Medicine, *Fuchſius* ſays, that he cured above a hundred Dyſenterics in one Year. *Riverius* tells us of a Dyſenteric that only uſed the Decoction of Pimpernel with Water and Butter, and ſo was cured in three days, *Bruyernius* writes thus of himſelf being troubled with a Dyſentery. *We* ſays he, *being terribly afflicted with a Dyſentery, lay given over by the Phyſitians: for no Remedies were able to aſſwage or Cure the Diſeaſe: At length by the Advice of an old Woman, upon eating a great quantity of raw Services, the next day I felt all my Pain almoſt abated. And by this means my Belly being ſhut up, and I, as it were recalled from the dead, and reſtored to my former Health; experienced the ſaying of* Celſus *to be true, that Raſhneſs does more in Diſeaſes than Prudence can do.*

OBSERVATION XXX.

A Conſumption.

LEwis *Gulielm*, a Sea-man, about thirty four Years of Age and indifferently robuſt, had ſometimes before lain Sick of a Malignant Fever; of which by the Aſſiſtance of God I had cured him. In the Month of *October*, about a Month after the cure of the ſaid Fever he was taken with an Extraordinary Catarrh, occaſioned by a Salt and ſharp Defluxion that fell upon his Lungs; a ſhort while after, in Coughing he ſpit a great quantity of Blood; and not long after this ſame ſpitting of Blood he alſo ſpit Corruption. More then this, there was mixt with his Spittle, a white Viſcous and very Tenacious white ſlime, which he ſpit forth every day with a great quantity of Matter and Blood. This Diſeaſe was accompanied with a ſlight Fever but not continuous, The Patient was all over conſumed away and ſo hoarſe that he could hardly ſpeak, he alſo complained of an inward oppreſſive Pain in his right Lung; and ſaid that he was ſufficiently ſenſible that what he ſpit forth aſcended from that ſide of his Breaſt, ſometimes he was almoſt Suffocated with Coughing, by reaſon of the Tenacious Matter ſticking in his Throat; for the cure of this Diſtemper, I gave him many and various Remedies for a long time to ſtop the Catarrh, abate and lenify the Cough, promote Expectoration, drying and Vulnerary Medicins, Decoctions of *Guaiacum*, *China* and *Saſſaperilla*, *Haly's* Powder againſt a Conſumption, Looches, and other proper Medicaments but all in vain, at length when theſe things nothing availed, but that the Ulcer grew worſe and worſe, and the Patient grew averſe from taking any more Phyſic, his Body being become as lean as a Skeleton, and his ſtrength more and more failed him, we were conſtrained for ſome time to give over the uſe of Phyſic; In the mean time to repair his ſtrength and ſupport Nature, I ordered him to drink a Draught of Goats Milk, newly Milked from the Goat and Blood-warm; beginning with a leſs quantity till he came to a Pint, after he had continued to take this Milk for two or three Months, his Cough began to abate and his Lungs to dry up; he ſpit little and gathered ſtrength every day. Therefore ſtill continuing the uſe of it, the Ulcer in his Lungs was perfectly conſolidated, and he luckily eſcaped a moſt dangerous Conſumption, neither did he perceive any thing of evil in his Breaſt for ſeveral Years, till twelve Years afterwards, he relapſed into the

ſame

ſame Diſtemper through a Defluxion of ſharp Rhums, and in regard I then lived at *Nimeghen*, and for that other Phyſicians did not preſcribe him proper Medicins, he died altogether conſumed and emaciated.

ANNOTATIONS.

A True *Phthiſis* or Conſumption is a very dangerous Diſeaſe, which few eſcape. Sometimes by long uſe of Medicines the Miſchief may be aſſwaged for a time, and Life may be ſomewhat prolonged, but the Patients are very rarely perfectly cured; and yet in the foreſaid Patient we prevailed ſo far, that he liv'd Eleven Years after the Cure, in perfect Health. Now that Milk contributes very much to the Cure of a Conſumption, is confirm'd by the Teſtimonies of *Galen*, *Rhaſis* and ſeveral other Ancient and Modern Phyſitians. Therefore, ſays *Sennertus*, ſpeaking of a Conſumption, *The moſt proper Medicines here to be made uſe of, are ſuch as anſwer all our ends; ſuch as conſolidate the Ulcer, reſtore the Emaciated Body, and mitigate the heat of the Fever. Of which the chiefeſt is Milk; then which, as* Galen *affirms, there can be nothing more prevalent given to Cure Conſumptions.* And then again. *Among Nouriſhments, Milk obtains to be preferred above all others. It nouriſhes the Body extreamly, affords good Matter to the Blood, tempers the Acrimony of vitious Humors, cleanſes the Ulcer with its ſerous Part, with its Cheeſy part it contributes Conſolidation, and with its Buttery Part, it moiſtens and reſiſts the dryneſs of the Body.* The ſame Commendation *Riverius* gives to Milk in his Treatiſe of Phyſical Practice. But in the uſe of Milk ſeveral things are to be conſidered. 1. With whom it does not agree. 2. When, and how, it is to be given. 3. What quantity. 4. How it is to be corrected. 5. What Milk is convenient.

1. *Crato* tells for what Perſons Milk is not convenient in theſe words. *Let Practitioners in Phyſic obſerve three Conditions in the Preſcription of Milk; firſt that there be no weakneſs, nor pain in the Head. For* Hippocrates *tells us, it is not good for ſuch.* Secondly, *That the Fever be not very violent; For it is almoſt impoſſible, but that Milk muſt corrupt in the Stomac of a Perſon troubled with a violent Fever.* Thirdly, *That the Bowels be not diſtended with Wind.* And of this opinion alſo is *Sennertus.*

Secondly, Milk muſt be taken upon an empty and clean Stomac, elſe it grows ſowr and corrupts. Alſo it is to be taken newly milked and warm, or ſuckt from the Teat: For if it be cold it gathers filth; if it be boyled, it becomes thick, viſcous and ungrateful. After the Patient has taken it, let him not ſleep, nor take any other meat or drink, (as Wine, Vinegar or Stale-beer) before the Milk be ſufficiently corrupted in the Stomac.

Thirdly, Let the quantity be ſmall at firſt, about four or five Ounces, that the Stomac may accuſtom it ſelf to it by degrees; then increaſe it to half a Pint, and ſo to a Pint. For it is to be always given in ſuch a quantity, that the Stomac may be able to bear and concoct it: And therefore you muſt aſcend from the leſs to the greater quantity; firſt once, then twice, then three times a day.

Fourthly, To prevent the Milk from curdling or growing ſowr in the Belly, a little Sugar may be mixt with it (*Riverius* praiſes the mixture of Sugar of Roſes) which however is not neceſſary where there is no fear of Coagulation. Other Phyſitians mix Honey with it; but we do not approve that Mixture.

Fifthly, In the laſt place there is ſome choice to be made of the Milk. *That womans Milk*, ſays, *Mercurialis, is certainly the beſt, there is no body will queſtion.* For this without doubt is moſt agreeable to the Nature of our Bodies. And *Zacutus* of *Portugal* ſays, that he perfectly cured a Conſumptive Perſon with the uſe of it. And ſuch another Cure *Valleriola* relates. So *Plater* tells us that he had ſeen ſeveral recovered by ſucking Womens Milk from the Teats. Among which there was one that not only recovered, but gathered ſo much ſtrength, that becauſe he would not want Milk for the future, he got his Nurſe with Child again. Next to Womans Milk, are Aſſes, Cows and Goats Milk. Aſſes Milk is thinner, more ſerous and properer to cleanſe the Ulcer. Cows Milk leſs ſerous, but more nouriſhing. Goats Milk differs not much from Womans Milk. It drys and conſolidates very much. By the uſe of this our Patient was cured.

OBSER-

OBSERVATION XXXI.

Vomiting.

Monſieur de Guade a Captain in the King of *France's* Army, was taken with a Vomiting which laſted for three days together, nor would any Vomitories or any other Remedies given him do him any good; I found that what he Vomited up was a frothy kind of Flegm (which the Patient himſelf affirmed to be Salt) with which there was a little Choler intermixed; however he did not Vomit up very much, but little often, and with violent ſtraining. We gave him twice or thrice a good draught of the Decoction of Barley luke-warm, ſweeten'd with a little Honey; which when he had Vomited up again, with a great quantity of tough Flegm; At length we gave him Cinnamon water Diſtilled with Wine ʒ ſ. with which we mixed three drops of Oyl of Cinnamon; which when he had taken, he found himſelf better. Half an hour after we gave him the ſame again. In the mean time we laid the following Cataplaſm to the Region of his Stomach.

℞. *Flowers of Mint, Baum and red Roſes an. half a handful; Mace,* ʒ ſ. *Clove-gillow-flowers, Nutmegs, Maſtic, Olibanum, Storax, Benjamin, an.* ℈ij. *make a Powder, to which add ſower Leven,* ʒiij. *Vinegar of Roſes,* q. ſ. *make all into a ſoft Paſt without boyling.*

With theſe few things the vehement Vomiting ceaſed. The troubleſom Vomiting, which had laſted a whole day, I ſtop'd, by giving him twice the following draught.

℞. *VVhite-wine warmed before the fire,* ʒij. *Oyl of Clove-gillow-flowers one drop, of Cinnamon two drops, mix them for a Draught to be taken very VVarm.*

The Region of his Belly was alſo anointed with Oyl of Nutmegs warm.

ANNOTATIONS.

VOmiting is caus'd by the conſent of other Parts, as when the Meninxes of the Brain are wounded, or that the Kidneys are troubled with the Stone or Gravel *&c.* Which Vomiting ceaſes, when the Diſeaſe is Cured of which it is the Symptom. Or it is excited by the abundance and ſharpneſs of Humors that ſtimulate the Fibers of the Stomach; which are either Choleric and hot, or Flegmatic Salt and cold, or Melancholic and Salt, or ſanguineous extravaſated and corrupting into the Stomach, or flowing in too great a quantity into it. At the beginning of the Cure, the Vomiting is ſtill more to be provoked, that the Stomach may be well waſh'd, and freed from the Cauſe of the Diſtemper: for according to *Hippocrates* a Vomit cures Vomitting. This done the Stomach is to be fortified either with cold or warm Medicaments, as the Cauſe of the Diſeaſe is either Hot or Cold. If the Cauſe be Hot, Juleps made with juice of Pomegranates, Quinces, Citrons, and Oyl of Vitriol are proper. The raw juice of Quinces alone, taken one or two ſpoonfuls at a time miraculouſly ſtays this Vomiting. Outwardly Fomentations with a Spung dipped in Vinegar of Roſes or Elder-Vinegar warmed, or a Quince roaſted and applied warm in the form of a Cataplaſm, or ſowr Le-

ven

ven mixed with Vinegar and juice of Mint, and applied, which very quickly ſtays Vomiting, and is highly extolled by *Villanovanus*. Alſo ſmelling to Vinegar, Camphire and the like, may be very prevalent.

If the Cauſe be cold, the Stomach is to be corroborated with hot things, as Wine, *Matthiolus's Aqua Vitæ*, Cinnamon-water, Oyl of Cinnamon, Nutmegs, Mace, Clove-Gillowflowers, Spirit of Vitriol, and ſuch-like Diſtillations. Among Simples all hot Stomach-Herbs and Spices; alſo outwardly Applications of Caſtor, Storax, Labdanum, Benzoine, Galbanum, Tacamahacca, Olibanum, Oyl of Nutmegs and Mace, *&c.* To which add Quinces, Maſtic and other Aſtringents. If theſe do no good, *Fallopius* gives you this Experiment. *If the Vomiting do not ceaſe, let him bite a piece of a Turnep twice or thrice, and champ it only with his fore-Teeth, and you ſhall ſee the Vomiting will abſolutely eaſe, tho his Stomach be very weak; And this Remedy is ſo extraordinary, that I could never find a better.* If theſe things will not ſtay the Vomiting, you muſt come to Narcotics among which in a cold Cauſe, *Roman Philoniam* is preferred above all the reſt given to the quantity of one dram. But in a hot Cauſe Pills of Storax or *Opiate Laudanum.*

OBSERVATION XXXII.

A Country Man of *Groesbeck*, who becauſe of his extraordinary Stature was called Ironically *Little John* about forty years Old, and very ſtrong, about two years ſince being very haſty in Cleavingof Wood, by chance receiv'd a hurt from a Splinter in the fore Tibiæon Muſcle of his right Thigh; the wound not being very broad, but reaching to the *Perioſteum.* This wound though he ſlighted it at firſt, it could never afterwards be conſolidated by any Remedies, but remain'd like an Iſſue, Nature voiding continually ſeveral Excrementious Humors out of it; which was the reaſon that the Country Man was troubled with frequent Inflammations and other Miſchiefs. At length in *September*, having by Accident ſold a parcel of Wood, to a certain Chyrurgeon of *Nimeghem*, after he had ſhew'd him his Thigh, the Chyrurgeon promiſed to conſolidate the little wound, which had now been of two Years ſtanding. The other weary of his Pain and trouble, gladly accepted the Condition, preſently the Chyrurgeon, without ever Purging his Body, thruſt in Tents with I know not what Oyntment into the wound, and laid on Plaiſters, the Fatneſs of which the parts adjoyning to the *Perioſtea* brook'd but very ſcurvily. Hence within three days by reaſon of the ſtoppage of the deprav'd Humors now remaining within, a terrible Inflammation of the whole Thigh enſued, with a vaſt ſwelling and intollerable pain, that threatned nothing leſs than a Gangrene. Then my Advice was ask'd. Preſently after I had thrown away all the other applications and the Oxycrate that was bound about his whole Thigh, I ordered the wound to be well waſhed with Spirit of Wine, and then that they ſhould pour in Balſam of *Peruæ* warmed, with ſome few grains of Camphire mix'd with it, and that his whole Thigh ſhould be wrapt about with Linnen Cloths dipped in Spirit of Wine. I alſo Purged his Body, and the next day let him Blood, and preſcrib'd him a proper Dyet. By theſe means not without ſome trouble, the inflamm'd Swelling being fallen, his Thigh within ſix days was reſtor'd to its firſt Condition. But in regard that afterwards ſome new beginnings of an Inflammation (with which he was wont to be moleſted before) began to appear, I clapt the grey Plaiſter about his whole Thigh, having mixed with every ounce of the Plaiſter ℈ij. of Camphire, which I let lye for three weeks together, only putting in a freſh Plaiſter three times,

times, which prevented the return of thoſe Inflammations. In the mean time, to Cure the wound alſo I ordered firſt an Iſſue to be made with a potential Cautery on the other ſide of the ſame Thigh; from whence before I could well pull off the Bliſter, Nature by this new Paſſage evacuated all thoſe evil Excrementitious Humors, which before were voided through the wound, and the wound cloſed within a few days with the only application of the Balſam of *Peru*, camphorated. But I perſwaded him to keep the Iſſue open as long as he liv'd. But his Thigh being thus Cur'd, the Country-man complained to me of another Malady no leſs ungrateful to his Wife, that his Inclinations to conjugal performance were utterly extinguiſh'd, and his Venereal Ability quite loſt, which Malady he ſaid had befallen him but ſince the Cure of his Thigh. Preſently I ſuſpected that this Languidneſs proceeded from the uſe of the Camphire, which I had mixed with the Balſam and other Plaiſters; ſo that I forbore the farther uſe of it, and gave the Country-man Electuary of *Dyaſatyrion* to take, and preſcrib'd him a Nouriſhing Dyet of Hot Meats, with Spices, Leeks and Onions, which reſtored him to that Degree that he followed his Wives *Agriculture* as he was wont to do.

ANNOTATIONS.

LET your Chyrurgeons learn from hence not to truſt too much to the Certainty of their own knowledge, and make ſlight of Wounds of this Nature. Much more let them be careful how they go about to cloſe them too ſoon, leaſt by their ignorance cauſing Gangrenes and Mortifications, they prove the loſs not only of their Patients Limbs but Lives. Firſt therefore let them carefully conſider, whether Nature have not been accuſtomed to evacuate excrementitious Humors through that Wound, and then let them not begin the Cure, till they have cauſed a Diverſion ſome other way. Next, let them examin the place affected very well, whether the *Periosteum*, or any Nerve, or ſuch like thing that cannot endure fat Plaiſters, lye near the Part, and then what Topics are convenient. In the next place let them Purge the Body well before they begin the Cure, by that and all other convenient means to prevent the Afflux of corrupt Humors to the Part affected; for the Humors eaſily deſcend to the lower Parts.

As to the Cure of the Country mans Frigidity, we have obſerved ſtrange things in the uſe of this Camphire. The very ſmell and fume of it drawn through the Noſe, being ſufficient to extinguiſh Venereal Ardor, according to the Verſe,

Camphora per nares caſtrat odore mares.
Such is the ſmell that Camphire yields;
That through the Noſe the Odour gelds.

But I could hardly have believed, that being laid upon the Thighs it ſhould have had this Operation. But I remember my Brother met with the ſame Accident in the Cure of *Mounſieur Edward*, who was troubled with old Ulcers in his Thigh; and who having worn a camphorated Plaiſter for two Months upon his Thigh, found his Venereal faculty quite extinguiſhed, and his Wife full of ſad Complaints; who nevertheleſs by the uſe of hot Medicaments, a Nouriſhing hot Dyet, not without his Wives conſent, was reſtored to his priſtine Vigor. Now becauſe of theſe extraordinary Vertues in Camphire, certain Monks in *Germany*, who were more deſirous, then uſual, to live a chaſt Life, hang it up in the Barrel to ſteep in Ale, which they uſually drink, on purpoſe to ſuppreſs their carnal deſires, and to avoid the Temptations of *Venus*. This occaſioned a very pretty Story at *Nimeghen* of a Carpenter, who being hired to mend the Floor in a certain Monaſtry in the Territory of *Cleves*, in Lent-time, when the Monks chiefly Camphire their Ale, and being forced to ſtay there till he had finiſhed, for three or four Months, drank of their Ale all the time. But when he came home to his Wife, never was a Gueſt more unwelcome in this World. For not having the leaſt inclination to Venery,

he was forced to leave his Farm untilled; which impediment was afterwards however removed in a ſhort time by the uſe of hot things. Nevertheleſs the Carpenter hated that Monaſtry ever after, and never would work there any more. Some attribute this Faculty of extinguiſhing *Venus*, to the cold and drineſs of Camphire, but erroneouſly; For its ſavor and its aptneſs to take fire, declare that it is not cold but manifeſtly hot; and therefore it muſt be aſcrib'd to ſome occult quality, which is ſaid to be in *Agnus Caſtus*, *Mint* and *Rue*, all which things are hot, and yet we find by Experience that they extinguiſh Venery. *Sennertus* attributes this faculty to the dryneſs of Camphire. But there are many other things which are endued with the ſame and a greater dryneſs, which have no ſuch Anti-venereal vertue; For dryneſs alone will not make a Man Frigid; *Scaliger* endeavours by the Example of a Dog, to ſhew that Camphire does not extinguiſh Venery, but erroneouſly; Since the conſtitution of a Man is different from that of a Dog, and therefore becauſe the operation is not in both the ſame, it does not follow that we ſhould make concluſions againſt known experience.

OBSERVATION XXXIII.

The Head-ach.

THE Wife of Captain *Schayck*, a ſtrong Woman of forty years of Age, had a violent Head-ach for three Months together. All the Remedies preſcrib'd her in the Camp would do her no good. At length in *September* ſhe came to me. I preſcribed her a proper Dyet, and after I had well Purged her Body, I preſcribed her this Quilt.

℞. *Leaves of Marjoram, Roſemary an. two little handfuls, of Sage, red Roſes and Melilot, an. one little handful; Maſtic, Olibanum; Nutmegs an.* ℈ij. *Cloves* ℈j. ſ. *beat theſe into a groſs Powder, and ſow them up in a red Silken Quilt.*

This being laid upon her Head the intollerable pain began to abate, and in a few days vaniſhed. She prized this Quilt ſo highly, that ſhe caus'd the Apothecary to make her two more; the one for her ſelf, the other for her Kinſ-woman, who was troubled as much as ſhe was with the ſame Diſtemper.

OBSERVATION XXXIV.

Suppreſſion of the Courſes.

JOan *N.* a Young Plethoric Maid, about twenty four years of Age, had her Courſes ſtopt for three Months which was occaſioned at firſt by her exceſſive Drinking cold raw Whey. Hence Paleneſs, loſs of Stomach, Vomiting, Head-ach, and the like. The firſt of *October*, I preſcrib'd her a convenient Dyet, and Purged her Body with the Infuſion of the Leaves of Senna and Agaric, with which I mixed *Hiera Picra*. Afterwards I preſcrib'd her theſe things.

℞. *Roots of round Birth-wort* ℥ij. *of Dittany, Maſter-wort, Valerian an.* ℥j. ſ. *Leaves of Nep, Penny-royal, Southern-wood, Savine an. half a handful, Worm-wood a little handful, ſeeds of Gith, Parſley an.* ℥ij. *of Lovage* ℥j. ſ. *of Aniſe, Naſturtium, Biſhops-weed, an. Oriental Saffron* ℈j. *make theſe into a groſs Powder to be put in a Bag, and ſo to be hung up to ſteep in five Pints of White-wine.*

R.

℞. *Trochiſchs of Myrrh.* ℈j. ſ. *Species of Hiera, Diacurcuma, Oriental Saffron an.* ℈j. *Caſtor, Venetian Borax an.* ℈j. *Gum Ammoniac diſſolved in Vinegar of Squills* ʒj. *for a maſs to be made into Pills about the bigneſs of a Pea.*

Of theſe Pills ſhe ſwallowed five every Morning and Evening, drinking after them ʒiiij or v. of the foreſaid Infuſion. At length on the fifteenth of *October* her Courſes came down. But two days after her Purgations began, ſhe went too ſoon into the Cold Air, and the Wind, and ſtopp'd the Work of Nature ſo luckily begun. Hence immediately a Suffocation of the Womb enſued, ſo that ſhe ſeemed to be almoſt choaked. I ordered Caſtor, Aſſa fetida and green Rue to be tyed in a bag and held to her Noſe. And once a day ordered her to drink ſome of this Decoction.

℞. *Roots of Valerian, Maſter-wort an.* ʒ ſ. *Leaves of green Rue* M. j. ſ. *of Fever-few,* M. j. *down of Nuts,* ʒ ſ. *ſeed of Lovage,* ʒ v. *of wild Carots, of Biſhops-weed an.* ʒj. *Wine and Common-water equal parts, boyl them to a Pint.*

But in regard the Women that ſtood by, deſired that ſomething might be laid to her Feet to draw the Matrix down, I preſcribed this following Paſte which was laid to her Feet:

℞. *Leaves of Green Butter-burr,* M. v. *bruiſe them ſmall, adding to them ſowr Leven,* ʒiij. *Salt* ʒj. ſ. *Wine, Decoction of Fever-few,* q. ſ. *make a Paſte.*

This abated the Uterine ſuffocation. But in regard it was not altogether gone off the twentieth of *October*, ſhe was Purged again with *Hiera Picra*, the twenty firſt ſhe took the Decoction again. The next day ſhe took a Sudorific; after which when ſhe had Sweat well, ſhe was freed from her ſuffocations.

℞. *Crabs Eyes prepared, Salt of Carduus an.* ℈j. *Treacle of Andromach.* ʒj. *Caſtor, Saffron an.* gr. iiij. *Treacle-water* ʒj. ſ. *Oyl of Amber, drops* xii. *mix them for a draught.*

The reſt of the Cure, there being no neceſſity, we deferred till the eight of *November*, at what time ſhe returned to the uſe of her Pills, and Infuſion preſcribed *October* the ſecond: *November* the fourteenth, ſhe was let Blood in the Saphæna Vein, of the left Foot: the eighteenth her Courſes came down plentifully, and from that time ſhe contiued in Health.

ANNOTATIONS.

AT the ſame time that the Courſes flow, it behoves Women to have a great care of themſelves, otherwiſe they are eaſily ſtopped again by drinking cold Water, or from cold Air or Wind getting into the parts, or catching cold in the Feet, or upon frights or miſtake in Diet or otherwiſe, which afterwards prove the cauſes of grievous Maladies; as it befel this our Patient. Thus *Foreſtus* tells a Story of a Maid, that when ſhe had her Courſes, waſhed her Rooms bare-foot, which putting a ſtop upon her Courſes, terrible Symptoms enſued; nor could that Flux be brought down again till after ſome Months. The ſame Perſon relates another Story of a Young Girl, that at the time of her Courſes leapt into the Water; and of a Country Wench, that at ſuch another ſeaſon ordered her ſelf to be let Blood.

For the Provocation of the courſes, we uſe many Remedies and as variouſly compoſed, as we find the Patients willing to take them, and for that reaſon, beſides the Hiſtorical infuſion, we gave our Patient Pills, as more grateful, and no leſs effectual in that diſeaſe; which Pills many Phyſitians preſcribe after ſeveral forms, *Montagnana* praiſes theſe.

℞. *Trochiſchs of Myrrh*, ʒj. ſ. *ſeed of Parſley, Caſſia-wood, an.* ℈ ſ. *Moſch*, gr. xv. *make them into Pills with the juice of Parſley.*

Sennertus commends *Trochiſchs* of of Myrrh taken in Pills, and theſe alſo;

℞. *Trochiſchs of Myrrh*, ℈iiij. *Extract of Gentian, Savin, an.* ℈j. *Caſtor* ℈ ſ. *make theſe into Pills; the doſe is* ℈ij.

Others believe theſe more Effectual.

℞. *Trochiſchs of Myrrh, ſpecies Hiera Diambre, Venetian, Borax, prepared Steel, Caſtor, an.* ℈ij. *Saffrons*, ℈j. *Gum Ammoniac, diſſolved in Vinegar, of ſquills*, ʒiij. *make ſmall Pills, the doſe from* ℈j. *to two.*

Zacutus of *Portugal* tells of a Noble *Matron*, that reduced to the laſt Extremity when no other Remedies would do her good was cured at length by taking Pills only of Steel, and Powder of Calamint prepared with Syrup of Mug-wort, of which ſhe took one dram in the Morning, and exerciſed upon it for the ſpace of twenty days.

As for laying Medicins to the Feet, if they have no great force in Uterin Maladies, yet they do no harm, and therefore the deſigns of Patients may be ſatisfied in that Particular, eſpecially thoſe things having the approbation of great Phyſitians, as being uſeful by their peculiar Qualitys, as Mug-wort, Peny-royal, Savin, Fever-few, cheifly the Leaves of the Butter-bur, and Burdock, which are thought by ſome to be of that force, that being laid upon the Head they draw the Matrix upward, being apply'd to the Feet they draw it downward. The ancient alſo uſed to tye to the Feet of menſtruous Women, and Women newly deliver'd to provoke the courſes, Spunges dipt in Vinegar and ſqueez'd again.

OBSERVATION XXXV.

An immoderate and violent Purging.

A Kinſman of that Stout and Valiant Gentleman Mr. *Lucas*, Captain of Horſe, about forty years of Age, finding himſelf not very well, by my Advice ſteeped all Night in ʒiij or iiij of ſmall Ale, Leaves of Senna ʒij. Rhubarb ʒj. and Aniſeed ℈ij. (for he ſaid he was eaſily moved) and drank the Straining the next Morning. This ſlight and gentle Purge within the ſpace of eight hours gave him about three-ſcore Stools, and perhaps there had been an end of his Life, had I not ſtayed the Flux with the following draught, and provoked him to Sweat.

℞. *Terra Sigillata* ℈j. ſ. *Red Coral prepared, Harts-horn burnt an* ℈j. *Treacle of Andromachus* ℈iiij. *Nicholas's Reſt* ℈j. *Treacle and Carduus-water an* ʒj. *mix them for a draught.*

I ordered alſo Napkins ſcalding hot to be applyed to his Belly one after another, and ſo the Flux ſtayed. I perſwaded him for the future not to take any Purge by the Advice of any Phyſitian, though never ſo gentle, unleſs upon eminent neceſſity, but rather to looſen his Belly with a Glyſter, or ſome Emollient Broth.

ANNOTATIONS.

THoſe Phyſitians are unfortunate, who at the Beginning of their Practiſe meet with ſuch a Patient as this; for they expoſe themſelves not to a little hazard of their Reputation. For it happens in Phyſic, that the younger Phyſitians are called the beſt Tormentors; and if by their Medicaments they cure any Patient of a dangerous Diſeaſe, it is aſcribed to chance, but if the Patient miſcary under the violence of the Diſtemper, then they impute it to the Phyſitian and his Preſcriptions. Thus without doubt here had been ſome miſtake laid to my charge, had the Medicament by me preſcribed been prepared in an Apothecary's Shop; and People would have ſaid there had been ſome Poyſon mixed with it; but I was freed from that Calumny, in regard that Capt. *Lucas*'s Wife made the Infuſion and prepared it her ſelf. The ſame accident befel my Brother alſo, who having preſcribed only a Dram of Rhubarb for a Gentleman to take, and to ſteep it firſt at his own Houſe in ſmall Ale, by that ſingle Draught had above forty Stools.

There is a great difference in Men as to Purging; ſome ſtrong Men, whom hardly any Medicaments will ſtir, ſometime, the moſt eaſie and gentle Phyſic caſts them into violent Fluxes. Others who are lookt upon to be moſt eaſily and ſooneſt moved, many times the ſtrongeſt Purgations will not ſtir. Thus I knew a Man of a very ſhort Stature and Lean, whom nothing could Purge but Tobacco ſteep'd in Ale all Night, and the ſtraining given him next Morning; nor did that give him above three or four Stools without any Alteration; which would have put another Man in danger of his Life. The Wife of *Simon Wigger*, a weak and lean Woman could hardly be Purged with any Cathartic, only Tobacco moved her; and that without any trouble. *Cornelius Steenacker*, a School-maſter, a very weak Man, was ſo hard to be Purged, that ſometimes he could not be moved with Compoſitions of Antimony and other vehement Cathartics.

On the other ſide, there are ſome that the very looking upon Phyſic will give them a Stool. Thus I knew a Young Lady, whom the very ſmell of the Phyſic Purged as well as if ſhe had ſwallowed it; for when ſhe took the Phyſic it ſeldom worked more. *Alexander Benedictus*, alſo and *Eraſtus*, *Johanes Poſtius*, and *Rondeletius*, quote the like Examples of ſuch as have been Purged by the ſmell of the Phyſic only.

OBSERVATION XXXVI.

A Stinking Breath.

THE Son of *Jodocus N.* a Nobleman had a very Stinking Breath. His Parents believed that the Original of this Malady proceeded from his Stomach; and for that reaſon many times gave him *Hiera Picra*; which doing him no good, they came to me. I preſently found that the Cauſe did not lye in his Stomach, but in his Gums and Teeth: for that the dregs of his Meat detain'd long in the ſpaces between his Teeth, and there corrupting, begot that Evil Smell. I ordered them there to cleanſe his Teeth twice or thrice a day very well with a Tooth-Pick, and then to waſh them well with his Water.

℞. *Powdered Allum* ℥j. *common Water* ℥ v. *Cinnamon water* ℥ſ. *Oyl of Vitriol* ix. *drops, mix them well together.*

After he had uſed this for a few days, the ill ſmell of his Breath was no longer perceived.

AN.

ANNOTATIONS.

THere are ſeveral Cauſes of a ſtinking Breath; ſometimes it proceeds from Exulcerations of the Lungs, as in Phthiſical People: Sometimes from ill vapours corrupting the Lungs, as in the Scurvy; ſometimes (according to *Bauhinus*) from the looſneſs of the Valve at the beginning of the thick Inteſtine, through which the continual ſtench of the Ordure paſſing through the thin Guts and the Stomach, breaths through the Mouth; ſometimes it proceeds from the fault of the Teeth only, when they are not well cleanſed every day, ſo that the remnants of chawed Meat corrupt and putrify between the ſpaces; In which laſt caſe, an alumm'd-water is mainly beneficial, for that it reſiſts Putrefaction, and preſerves the Teeth from all Corruption.

OBSERVATION XXXVII.

Want of a Stomach.

CHriſtian *ab Ummerſom*, a Wine Merchant, in *March* 1636. was troubled with a Nauſeouſneſs, and loſs of Appetite for many days, ſo that for want of feeding he was become very weak. Now becauſe the Peſtilence was very rife at that time, he thought he had got the Infection: But it was not the Peſtilence, but his own Preſervative, which he drank every day before Dinner very plentifully, that was the Cauſe of his Malady, that is to ſay, Wormwood-wine, wherefore I forbid him to drink that, preſcrib'd him a proper Diet, and after I had gently Purg'd his Body, gave him the following Conditement:

℞. *Roots of Calamus Aromatic. Nutmegs, Mace; Flowers of Sulphur an.* ℈ j ſ. *Cremor. Tartar.* ʒ j. *choice Cinnamon* ℈ j. *Cloves* ℈ ſ. *Powder them very fine. Then add Roots of Candid Elecampane* ʒ vj. *Conſerve of Anthos* ʒ ſ. *Ginger condited* ʒvj. *Oyl of Vitriol drops* xv. *Syrup of Limons* q. ſ. *Make a Conditement.*

Of this he Eat a ſmall quantity Morning and Evening, and ſometimes before Dinner, abſtaining from Wormwood-wine; which after he had taken for ſome time, his Nauſeouſneſs ceaſed, and his Appetite returned. From that time he had ſo high an Opinion of this Conditement, that for ſome Years he cauſed his Apothecary to make it, as he ſaid, for the preſervation of his Appetite and his Health.

ANNOTATIONS.

GAlen aſcribes to Wormwood, a heating, cleanſing, corroborating, and drying faculty, Whence *Pliny* writes that it corroborates the Stomach, and that the Savour of it is with great benefit tranſlated into Wine; And as true it is that Wormwood-Wine (ſo much now in uſe, but by moſt deteſtably abuſed) is no new thing, but an antient invention, and very well known among the Phyſitians of old; which is apparent from hence, that *Diaſcorides* ſets down various Compoſitions of it, where he ſays that it is profitable for the Stomach, moves Urine, accelerates ſlow Concoction, and cures the Maladies of the Spleen and Kidnies, and Yellow Jaundiſe, want of Appetite, and Diſtempers of the Stomach; That it prevails againſt Inflations and Diſtenſion of the Hypochondrium, expells round Worms, and brings down the Courſes. All which Commendations of Wormwood-Wine, *Oribaſius* alſo confirms; but

but though Wormwood and Wormwood-Wine have many excellent qualities, yet there are bounds and limits ſet to all things; which if we exceed, we render good things miſcheivous, for that the beſt of Medicaments and Nouriſhments, if taken immoderately, prove hurtful, ſo I have many times obſerved, that the exceſſive and inordinate uſe of Wormwood-Wine cauſes Inappetency, extraordinary weakneſs of the Stomach, Liver, and the whole Body, Vertigos in the Head, loſs of Memory, Epilepſies, Dropſies, and ſeveral other Maladies, to which the daily drinkers of Wormwood-Wine are expoſed; many times to the utter ruin of their Healths, after which nothing but Death enſues; as it befel *N. Heymerick*, who dy'd of a Cachexy and Dropſie; and *Anthony N.* who dy'd of an Epilepſie, both daily drinkers of Worm-wood-Wine. Therefore Wormwood-Wine is only to be drank upon occaſion. I will here add one fooliſh Story, in the Year 1635. when the *French* Army quartered in *Nimeghen*, the *French*, to preſerve themſelves from the Peſtilence, drank Sack betimes in the Morning. But ſome of the Noble Men asking what the *Dutch-men* drank to preſerve themſelves from the Infection, the Vintner anſwered, Wormwood-Wine; which being a ſort of Wine, which they had never taſted, they called for ſome; but when they had taſted it they cry'd out, the Devil take the Vine that yeilded ſuch Wine as that; for certainly ſaid they, this is the very Wine which the *Jews* gave Chriſt upon the Croſs; for the *French-men* thought the Grape it ſelf had been ſo bitter, not knowing it to be a mixture.

OBSERVATION XXXVIII.

A Wound in the Lungs with a Muſket Bullet.

IN the Year 1636. in *May*, during the Seige of *Schenck Sconce*, a Trooper of our Army in a Horſe-Charge was Wounded with a Muſket-ſhot, in the Right ſide of the Breaſt, about the Pap, three Bullets paſſing through his Breaſt and his Right Lung, and going out again about the *Scapula*, at three ſeveral Holes in his Back. When he was brought to Quarters at *Nimeghen*, I went along with the Chyrurgeon, and by the Condition of the Wounds gave him over for Dead. However that he might not Dye through any negligence of Ours, we bound up his Wounds, loſen'd his Belly with a Glyſter, and gave him proper Medicines to ſtop the Blood, flowing out of the Lungs, we alſo thruſt in a Pipe of Lead into the lower Wound, through which the Blood and Matter might be Evacuated; but finding it could not be conveniently done in that Wound, we opened a more convenient paſſage in his ſide by an Intercoſtal Inciſion. For Diet, I forbid him all ſharp, cold, Salt, Acid things, as alſo meats of hard diſgeſtion and bad nouriſhment; but preſcribed him freſh Meats, broth made of Mutton, Lamb and Chicken, potched Eggs, new Milk and the like. And as to other things that concerned his Diet, we preſcribed as we ſaw occaſion; However we continued the uſe of Vulnerary, Pectoral Apozems, no Fever troubled him, and his Appetite was none of the worſt: after three or four weeks together with the Blood, (which in all that time had vented it's ſelf upward through the Leaden Pipe, ſometimes frothy, ſometimes watery, ſometimes curdl'd,) he began to throw up a good quantity of Matter with his Cough; which Spitting of Blood and Matter continued till the ſixth Month; ſo that there appeared no hope of recovery; for the Patient all waſted away, was reduced to utmoſt leanneſs and debility; however the poor Man willing to live, beſought us not to give him over, ſo that we could not chooſe but go forward, though we thought it to no purpoſe; in the firſt place, therefore, to repair his Strength, we ordered him to drink

drink a draught of Goats Milk, warm from the Udder, three times every day, and ſometimes we gave him corroborating Amygdalates, and Conditements; after we had made uſe of the Goats Milk for ſometime, his Spiting of Bloody Matter began to abate, and at length about the beginning of the tenth Month, after his being Wounded, ſurceaſed altogether, as did alſo his Cough; from that time forward, continuing the uſe of his Milk he gathered ſtrength every day more and more, and got Fleſh upon his Back; toward the end of the tenth Month he walked about the Chamber; and at the end of the eleventh Month, being perfectly cured, he walked abroad, nor was there any thing that troubled him after ſo dangerous a Wound: and I ſaw him ſeven Years afterwards riding ſound and well among the reſt of the Troops.

ANNOTATIONS.

VVOunds in the Lungs are very dangerous, and for the moſt part mortal, according to the opinion of *Hippocrates*, *Galen*, *Avicen*, *Celſus*, and of all the moſt Famous Phyſitians, and Chyrurgeons; for that being a Spungy Bowel it will hardly admit of any cure; but that they are not always mortal experience teaches us, in regard that very dangerous wounds of the Lungs given by Swords, have been known to have been perfectly cured; and others when part of the Lungs have been cut away. As *Rowland* of *Parma*, *Theodoric*, *Gemma*, *Valleriola*, *Hildan*, and others teſtifie; but you ſhall rarely hear of any that have been ſhot into the Lungs with Musket Bullets, who have eſcaped and been perfectly cured, becauſe the violent contuſion of the Bullet ſeems to admit no cure in that Spungy part, but rather threatens an Inflammation, a Gangrene, or a Mortification, though *Peter Futman*, deſcribes ſuch a cure done, in an Epiſtle to *Gregory Horſtius*; and ſuch a Cure it was that ſo luckily befel this Trooper through the uſe of Goats Milk, and other Medicaments; and indeed it is to be look'd upon as a very wonderful Cure; for my part I never believed before, that ever three ſuch VVounds in the Lungs with a Musket Shot, could have been cured by any means whatever, and ſhould have hardly believed it, had I not been an Eye witneſs; we have indeed ſeen VVounds in the Lungs with Swords and Knives cured; but that is not ſo wounderful, becauſe there is no Contuſion there, nor does an Inflammation ſo eaſily happen.

Beſides the ſaid Cure this is alſo to be admired in reference to this Trooper, that being ſo dangerouſly wounded he was not infected with the Plague, which was then very rife, as many that were wounded and ſick of other Diſeaſes were; but he was a ſtrong Man, in the Flower of his Age, and of a good Temper of Body in Captain *Conyers* a *Engliſh* Gentleman's Troop.

OBSERVATION XXXIX.

Burſtenneſs of the Guts.

THE Wife of *John Vermulen* an Ale Brewer, a Woman about forty Years of Age, had a Burſtenneſs of her Guts, protuberant in her right Groin about the bigneſs of a Gooſe Egg, it was accompanied with a total obſtruction of the Belly, by reaſon the Guts was fallen through the narrow hole of the Rupture into the Groin. The ſixth day after the beginningof the Malady I was ſent for; I ordered her to be Gliſtered twice, and the Gut to be gently put back by a Woman that profeſſed that operation; but all to no purpoſe, the Guts being ſo diſtended with Wind, neither the Gut nor the Wind would go back,

Fomentations

Fomentations nor other proper Topics availed nothing; upon which I told her, there was nothing but Death or a deſperate Remedy, that was, to dilate the *Peritonæum* by Inciſion, that the Gut might be put back through a large hole, my adviſe did not pleaſe: And therefore when I ſaw there was nothing elſe to be done, but what they were unwilling to permit, I took my leave and left the Patient for gone. After that an ordinary fellow a Stone-cutter that wandered about the Country to get buſineſs, commonly called Mr. *Gerrard* was ſent for, who boaſted that he would return the Gut in a ſmall time; but after he had ſeveral times attempted it in vain, he was diſmiſſed with more ſhame then reward, four days after his departure, the Groin putrifying and breaking, a great quantity of Excrements came forth to the great eaſe of the Patient, but her inevitable ruin; for the Gut was broken by the compreſſion of the Mountebank, which was the reaſon that the part was putrify'd ſo ſoon by the falling of the Excrements into the void hollow of the Groin, the laſt remedy then was to ſow up the Gut, and enlarge the *Peritonæum*; but in regard I ſaw no hope of recovery in ſo weak a Patient, I adviſed her to let it alone and prepare her ſelf for a more eaſie Death; but ſuch was her deſire of life, that neither the ſharpneſs of the Pain, nor the Apparency of the danger could deter her from the Operation, ſo that preſently ſending for four eminent Chyrurgeons ſhe deſired them to go to work. The Skin therefore and the adjoyning parts being opened with great torment, we found the thin Gut fallen out, and not only a little part of it broken, but almoſt torn aſunder, quite a croſs: for hardly the breadth of a Straw held the two ends of the Gut together; this was a certain Sign of Death; for had the ſolution been ſmall it might have been cured, but of this there was no hope; in the mean time the Gut was ſowed together with a Silk Thread four times twiſted, and well wax'd, and put up into the Belly, after a ſmall dilatation of the *Peritonæum*; and then Gliſters, proper Diet, and all things requiſite were preſcribed, the Patient complained of a great Pain about her Navel, which we could not aſſwage by any Fomentations, Bags or other Topics; otherwiſe ſhe was indifferent well, eat with an Appetite, neither were her Excrements amiſs. The fifth day after the operation, the Pain about her Navel encreaſed; and the next Night as the Patient was talking very heartily to the Company about her, pale Death came and interrupted her Diſcourſe.

ANNOTATIONS.

THIS Rupture was ſo narrow, that it was a wonder how the Inteſtine could fall through it, it being almoſt impoſſible to put it back as it was of it ſelf and empty, through ſo narrow a Paſſage, much leſs diſtended with Wind. Such a narrow Rupture I once ſaw before in one that was opened. Wherefore they do very ill, who endeavour to force back the Guts through ſuch narrow paſſages, like your ſtrolling Hang-men of Mountebanks; for that by ſuch a force the Gut may be ſooner broken then reduced, both Reaſon and Experience teach us. Burſten Guts therefore muſt be gently handled, and firſt we muſt endeavour with Cataplaſms, Fomentations and other proper Topics, to diſpel the Wind, and drive it back, and then without any violence to attempt the reducing of the Gut: which if they will not do; there is no way but dilatation of the *Peritonæum*.

OBSERVATION XL.

Difficulty of Urine.

Gerard Drieſſem, a Merchant about fifty Years of Age was troubled with a difficulty of Urine; ſo that his Urine did not only drizzle from him with great difficulty and Pain, but alſo very often came not forth at all. The cauſe was a certain viſcous and tenacious Slime, which at times falling down, in great quantity to the Bladder, did ſo beſiege the Sphincter, that it ſtopped both it's own and the paſſage of the Urine. This Slime deſcending through the paſſage of the Yard, and coming forth, was tough, and many times might be drawn out in ropes with the Fingers, many times it ſtuck ſo obſtinately to the paſſage, that there was a neceſſity of looſening it and drawing it forth with a long Silver-Headed-Bodkin; this Malady had been familiar to him for many Years, and ſometimes ſeized him three, four and five times a Year, and between the Intervals, he voided a great quantity of ſlimy Flegm, many noted Phyſitians had uſed ſeveral Remedies for the cure of this Malady; but all in vain, which Phyſitians vary'd in their opinions concerning the cauſe and generation of that ſame tough and ſlimy Flegm; as alſo about the place from whence it deſcended ſo Periodically; In the mean while the Patient could neither be cured by others, nor by my ſelf. The Malady therefore increaſing he found the greateſt benefit and eaſe by the following Potion, which he took very often, and by means of which his Pains were mitigated and his Urine provoked, and becauſe it rendered the Urinary Paſſages Slippery, he voided that thick and viſcous Flegm, more commodiouſly, with more eaſe, and leſs Pain, and in greater quantity.

℞. *Oyl of ſweet Almonds*, ℥j. ſ. *the beſt Malmſey-wine*, ℥ij. *Juice of Pome-Citron newly preſſed* ℥ ſ. *mix them for a Potion.*

ANNOTATIONS.

Sennertus, among other Cauſes of a *Dyſury*, reckons up one not much different from that already rehearſed. *Many times*, ſaith he, *a white, and as it were, a milkie Matter is copiouſly voided with the Urine, and cauſes a heat in making Water, which is ſometimes voided in ſo great a quantity, that where it ſettles, it fills up half the Chamber-pot; and ſuch a voiding of Water many times continues very long. Concerning its Generation, I have known ſeveral varieties of Opinions, and that ſome have taken it for a mattery Subſtance bred in the Kidneys. But if the whole Kidneys ſhould be diſſolved into Matter, it could not amount to ſo great a quantity as is ſometimes voided every day for ſeveral Weeks together. My Opinion is, that this matter proceeds from Crudity and vitious Concoction, firſt, of the Stomach, then, becauſe the Error of the firſt Concoction cannot be mended in the ſecond, of the Liver, where the Chylus, and afterwards the Blood is left raw, and uncleanſed from the Salt and tartarous Parts, which ought to be ſeparated in the firſt Concoction, which being afterwards attracted by the Kidneys, and tranſmitted to the Bladder, cauſe Pain in making water, eſpecially toward the end, while ſomething of the ſaid Matter ſticks pertinaciouſly to the Neck of the Bladder, and the Extremity of the Urinary Paſſage.*

For the Cure of this Malady there are many things very prevalent, which temper and dulcifie the Acrimony, and render the Urinary Paſſages ſlippery,

to

to afford a freer Paſſage for the thicker Matter; as Oyl of ſweet Almonds newly extracted, which is very uſeful in this caſe. Malmſie-wine, the drinking of which alone, as *Sennertus* writes, cured a certain Perſon that was troubled with a terrible Dyſury. The Decoction of Cammomil-flowers in Cows Milk, with which, *Foreſtus* writes, he knew an old Man cured: Or that Decoction with which we cured a Child, *Ob.* 7. Alſo the Decoction of Marſh-mallows, Mallows, Figs, Licorice and the like. *Fernelius*'s Syrup of *Althea*, more eſpecially Turpentine mix'd with Sugar, and ſwallowed in a Bolus, which cuts the thick Humors, attenuates, cleanſes, expels, ſoftens and mollifies the Paſſages.

OBSERVATION XLI.

Spitting of Blood.

M*Onſieur Joannes*, a Prieſt of *Craneburgh*, in the Year 1636. *February* the 16*th.* ſent me this Letter.

Doctor,

THE Fame of your Knowledg and Experience has over-rul'd me, to deſire your Advice in my Diſtemper. For a long time a violent Cough has troubled me, which will hardly permit me to reſt; moreover, about a Month ſince, this Cough was accompanied with a ſpitting of frothy Blood, which ever ſince I have continually ſpit, ſometimes in a leſs, ſometimes greater quantity; which Spitting is very troubleſome to me. I have loſt my Stomach, ſo that I can eat nothing, unleſs it be ſome ſmall Triſle mix'd with Vinegar, or ſome other Acid. If you have any proper Remedy, I beg you to impart it to us,

Your moſt Devoted

Joannes Sacerdos.

The ſame day I ſent him this Anſwer.

Reverend Sir,

I Received your Letter, to which, according to the ſhortneſs of the time, I ſend you this ſhort Anſwer; you have been long troubled with a ſharp and ſalt Deſtuction upon your Lungs, from whence your vehement and continued Cough has derived it ſelf: At length ſome Vein of the Lungs being opened by the great quantity of diſtilling Humors, or broken by the force of the Cough, pours out that Blood which you ſpit out frothy from your Lungs. This Malady cannot be cured, unleſs the deſcent of the Catarhs be prevented, and the Cough allay'd; to which purpoſe, I have here ſent you ſome Remedies. Firſt, *ſeven Pills to take to morrow Morning, which will gently purge you.* Secondly, *A Conditement, of which you are to take, after you have purged, the quantity of a Nutmeg, Morning, Noon, and Night, for ſeveral days together.* Thirdly, *A* Looch, *to lick when your Cough afflicts you.* Fourthly, *Lozenges to let melt in your Mouth as often as you pleaſe, as well in the Day as Night-time. To theſe four I have added a little Bag, what is in it you muſt put in a new earthen Pipkin, and heat it over the Fire without any Moiſture, then put it into the Bag again, and*

lay it to your Head as hot as you can endure it, letting it lye one or two Hours, and this you muſt do twice or thrice a day. When you take this off, put on a woollen Cap well fum'd with Maſtich and Cloves, bind a warm Napkin about it, to the end, that by this means, your Head being over cold and weak, may be again heated, corroborated and dry'd, that ſo the Catarh be ſtopped from further deſcent; which done, the remaining Cure will be eaſily accompliſhed. I am well aſſured, that by reaſon of the Wars, and your continual quartering of Souldiers, you cannot live with thoſe Conveniences about you as you ought to have, nevertheleſs you are to take the beſt care of your Diet you can; therefore you muſt keep your ſelf in a warm Place, and more eſpecially to preſerve your Head from all manner of Cold. As to your Diet, abſtain from all manner of ſalt and ſmoaked Meats, and all others of hard Digeſtion and Nutriment, more eſpecially from all Acids, as Vinegar, Juice of Limons, ſowre Apples, ſowre Wine, and every thing elſe that has any Acidity in it; for all Acids are hurtful to the Lungs. Broths made of Mutton, Lamb, Veal, Hens, Cocks, and the Fleſh themſelves boil'd with Roſemary, Marjoram, Barley cleanſed, and ſtoned Raiſins, potch'd Eggs, and Goats Milk, and in a Word, all ſweet things are proper. If the Malady do not yield to theſe things, ſend me back word of the State of your Diſeaſe,

Yours to Command,

J. de Diemerbroeck.

The Medicaments which I preſcribed him, were theſe.

℞. *Of the Maſs of Pill.* Cochiæ ℈j. ſ. *Diagredion* gr. v. *for ſeven Pills.*

℞. *Red Coral prepared, Blood-ſtone, Trochiſchs of ſeal'd Earth, an.* ℈ij. *Flowers of Sulphur* ʒj. *Olibanum, Tragacanth, Spodium, Harts-horn burnt an.* ℈j. *Conſerve of Red Roſes* ʒij. *Codigniach* ʒj. ſ. *Nicholas's Reſt* ʒj. ſ. *Syrup of Poppy,* q. ſ. *Mix them for a Conditement.*

℞. *Syrup of Jujubes, of Colts foot, of Licorice an.* ʒj. *of Poppy, Looch, Sarum an.* ʒj. ſ. *Mix them for a Looch.*

℞. *Heads of white Poppy,* n° v. *Cut them ſmall, and boil them half an hour in common Water* q. ſ. *Strain them very hard, with the Straining boil White-ſugar* ʒiiij. *to the Conſiſtence of a Lozenge, adding at the end Powder of the Root of Althea,* ℈j. ſ. *of Licorice ſlic'd* ʒj. *Flowers of Sulphur* ℈ij. *Red Coral prepared, true Bolearmoniac an.* ℈j. *Make Tablets according to Art.*

℞. *Herbs, Marjoram* m. j. *Roſemary, Bitony, Flowers of red Roſes, Melilot an.* m. ſ. *Cloves* ʒj. *Nutmegs, Cummin-ſeed an* ʒjj. *Beat them into a groſs Powder, and then add Millet-ſeed* m. iij. *Salt* m. ij. *Mix them together, and put them into a large linnen Bag.*

When he had uſed theſe Remedies for eight days, he wrote me word, that his Coughing and Spitting of Blood were very much abated, but not quite cured: Therefore to perfect the Cure, I wrote him

him word to continue his Pills, Looch and Conditement, and withal ſent him the following Preſcription.

℞. *Roots of the greater Cumfrey, Snake-weed, Tormentil, Fennel, an.* ℥ſ *Licorice ſlic'd* ℥vj. *Herbs, Hyſſop, Colts-foot, Scabious, Herb Fluellin, Plantain, Betony, Roſemary an.* m. j *Sage, Flowers of red Roſes an.* m. j. *Head of white Poppies cut ſmall* n° iiij. *Raiſins unſtoned* ℥iiij. *Dates* n° ix. *Decoction of Barley* q. ſ. *Boil to an Apozeme of* ℔ iij.

Firſt let him purge with his Pills, and make uſe of Looch, let him take his Conditement Morning and Evening, and drink a Draught of his Apozeme after it, about the end of *March*, he wrote me word that he was quite cured of his Cough and Spitting of Blood, that he ſlept very well, and could eat, and gave me many Thanks for my Advice.

ANNOTATIONS.

ALL ſpitting of Blood out of the Veins of the Lungs threatens great Danger, and therefore ought to be cured with great ſpeed and prudence. As *Benedict Faventius* obſerves, *If a Vein*, ſays he, *be broken with Coughing, and Blood ſpit out of the Lungs, it will never be conſolidated but with great difficulty and care of the Phyſitian.* This Cure is more eaſily, or with more difficulty accompliſhed, according to the variety of Cauſes, the Vehemency and Diuturnity of the Diſtemper, and the natural Strength of the Lungs affected. But among other Cauſes, this is one; when Nature endeavours to expel by the violent force of the Cough, the Humors ſtoping the ſpiritual Paſſages; for by that extraordinary Violence there is a force put upon the Organs of Reſpiration, ſo that they become very much extended with their Veſſels, and ſometimes broken, and then the Blood comes away with the Spittle. Such was the Blood-ſpitting that troubled our Patient, which was very dangerous, but leſs then if it had been occaſioned by ſome ill Diſpoſition of the Lungs, or Corroſion of the Veſſels, or any ſuch like Cauſe. However, had the Diſtemper perſiſted any longer, the Veſſels, without doubt, would have been corroded by the Acrimony of the diſtilling Humors, and the Strength of the Bowel would have fail'd, and then Suppuration, Conſumption, Rottenneſs, a Fever, and ſeveral other Maladies of difficult Cure, and for the moſt part mortal, would have enſued. But becauſe it was not come to that, and becauſe the Diſeaſe had been of no long ſtanding, and the Patient was of ſufficient ſtrength, the Cure was fortunately performed, and much ſooner than was expected.

OBSERVATION. XLII.

Suppreſſion of the Secondines and Courſes.

THE Wife of *Peter Vleys-houwer*, the ſixth of *March* miſcarried; preſently after her Secondines, Courſes, Urine and Evacuations of Excrement ſtopped, which expoſed her to imminent danger; eſpecially when the Medicaments given her by the Midwife availed nothing. The ninth of *March*, which was the fourth day after ſhe had miſcarried, I was ſent for, and preſently preſcribed her theſe things.

℞. *Roots of round Birthwort, Dittany, Valerian, Briony, Maſterwort, Fennel, an.* ℥iij. *Herbs, Mugwort, Penyroyal, Tanſie, Feverfew, Savin, an.* m. j. *Seed of Parſley, Lovage, wild Carrots* ℥ij. *red Vetches* ℥j. ſ. *White-wine* q. ſ. *Boil them for an Apozeme of* ℔ j. ſ.

℞. *Of*

℞. *Of this Decoction* ℥v. *Leaves of Senna cleanſed* ℥iij. *Beſt Rhubarb* ℥j. ſ. *Aniſeſeed* ℥j. *Choice Cinamon* ℈j. *Make an Infuſion for four hours, then ſtrain them very hard, and add to the Straining Oyl of Amber* ix. *Drops for a Draught.*

After ſhe had took this ſhe purged gently, and her Urine and Courſes came down in great Plenty, and her Secondines came forth by Piace-meals; and thus by this one Medicament ſhe eſcaped a very great danger.

OBSERVATION XLIII.

A Wound in the Brain with a Piſtol-ſhot.

MR. *Vane*, an *Engliſh* man, and Enſign of a Company, a ſtrong young man, about twenty five years of Age, at the Siege of *Schenk Sconce*, in the Year 1636. was wounded in the Head with a Piſtol Shot, a little Bullet entring through the inner Corner of his Right-Eye, without hurting the Eye, and paſſing through the Subſtance of the Brain in a ſtreight Line, to the upper Bottom of the fore-part of the Head, on that Side, in that Place ſtopp'd and ſtuck under the Bone. The Man, ſo ſoon as he was wounded, fell down in a deep Sleep, void of Senſe and Motion, and ſo was carried to *Nimeghen* for dead. No Man thought it poſſible for ſuch a Wound to be cured, in regard the Brain was ſo much prejudiced. However the Chyrurgeon prob'd to the place where the Bullet was lodg'd, and felt it about the upper part of the Lambdoidal Bone. Then he took a longer ſlender Inſtrument, like a Mold wherein they caſt Bullets, and thruſting it into the Wound, got hold of the Bullet, but as he was about to draw it out, I know not by what Misfortune, the end of the Inſtrument that claſp'd the Bullet broke, and that part of it which had taken hold of the Bullet, remain'd, together with the Bullet, in the Brain; yet not ſo, but that the end of it might be ſeen about the entrance of the Wound. However, for want of proper Inſtruments, we were forc'd to leave it in the Brain till the Evening, at what time, with proper Inſtruments, both the broken Inſtrument and the Bullet within it, were both drawn forth, and as much of the Subſtance of the Brain came out along with it as the quantity of a Nutmeg. Alſo ſome little bony Fragments ſticking to the Orifice of the Wound, were taken out. The Chyrurgeon applied to the Wound a Magiſterial Balſam, and Cephalic Fomentations were clap'd round about the whole Head, to ſtrengthen the Brain, and his Belly moved with a Gliſter. The next day ſome ounces of Blood were taken out of his Right-Arm. The fourth day after the Wound received, upon which we preſently ordered him ſome Broth for Nouriſhment. About the fourteenth day, that deep Sleep abated, and after that he only ſlept naturally. He was troubled with no Fever, nor did he looſe his Appetite. For ſome Weeks he took cephalic Decoctions and Conditements; but as for the Wound, nothing was put into it but the ſaid Balſam. Afterwards, inſtead of a Cephalic Fomentation, we took a dry Cephalic Cap, made of certain Cephalic and other Herbs, and clapt it about his whole Head. And thus this Perſon, ſo deſperately wounded as he was, after three Months, being perfectly cured, walk'd abroad again, and at the fourth Months end, returned again to the Camp. Six years after this

Cure,

Cure, coming to *Nimeghen*, he gave me a Viſit, affirming, that he retain'd no farther Inconvenience of his Wound, only that upon ſome ſuddain and tempeſtuous Change of Weather, his Head would ake a little; or if he drank Wine too freely, he ſhould preſently be intoxicated, and then he was almoſt mad; at other times he did whatever he had to do, as if he had never been wounded.

ANNOTATIONS.

Hippocrates affirms all Wounds of the Head to be mortal. The Bladder, ſays he, being broken, or the Brain, or the Heart, or the Midriff, or any of the ſmall Guts, or the Stomach, or the Liver, it is mortal. In which place, we are to underſtand by Mortal, not of neceſſity Mortal, but very dangerous, as *Galen* obſerves in his Comment upon that Aphoriſm. For Wounds of the Brain, that do not penetrate the Ventricles, do not of neceſſity cauſe Death; becauſe we find they are many times heal'd, as *Maſſa*, *Carpus*, *Jacotius*, and many others teſtifie. And *Avicen* thus writes, concerning Arrows to be drawn out of the Wounds of thoſe Parts. *If an Arrow*, ſays he, *be fixed in any principal Member, as the Brain, Heart, Lungs, Belly, ſmall Guts, Liver, Matrix or Bladder, and there appear Signs of Death, then we muſt abſtain from drawing out the Arrow, becauſe it will occaſion us to be look'd upon as Fools, when we know we can do the Patient no good: But if no ill Sign appear, then we go to work; for many times in ſuch caſes, ſeveral eſcape to a wonder.*

We therefore, following this Doctrine of *Avicen*, though the caſe ſeemed deſperate, yet becauſe all our Hope lay in drawing out the Bullet, drew it out from this Patient, whom no rational Phyſitian would have judged could have ever eſcaped; eſpecially ſince the Wound was made with ſo much violence of the Piſtol, accompanied with a Perforation of the Meninxes, and ſome loſs of the Subſtance of the Brain. Certainly, if ever there were a miraculous Cure, this was one. I could hardly give credit before to the Teſtimonies of Authors in this matter; and had I not ſeen ſuch Wounds as theſe, with loſs of the Brain, twice healed, I ſhould hardly yet have believ'd it.

OBSERVATION XLIV.

An Aſthma.

Andrew à Salingen, in the Month of *May*, was troubled with a vehement *Aſthma*, which afflicted him ſo terribly, that he could hardly ſpeak; he had no Cough, and ſpit but very little or nothing, and beſides, he had quite loſt his Stomach. He had taken ſeveral Remedies, by the Advice of others, for above half a year together. And for my Part, becauſe the Patient was threeſcore years of age; I did not believe my ſelf, that ever the Diſtemper could be eradicated; however, I told him it might be much abated and aſſwaged, and therefore bid him pluck up a good Heart, and take of the following Electuary Morning and Evening the quantity of a Nutmeg, and to abſtain from all acid and cold, flatulent, viſcous and ſmoak'd Meats, and in a word, from all Meats of hard Concoction and bad Nutriment.

℞. *Choice Myrrh, lucid Aloes, Flower of Sulphur, Elecampane, Licorice ſlic'd an* ℈j. *Saffron, Benzoin an.* ℈j. *Make theſe into a very fine Powder, then add the beſt Honey* ʒ xij. *Oyl of Aniſe, Drops* ix. *Mix theſe for an Electuary.*

By

By taking this, his Belly was gently looſned, and his Apetite reſtored; the *Aſthma* ceaſed to a Miracle; inſomuch that within a few days he was quite freed from it, and when the Malady afterwards return'd, he preſently cured himſelf by taking the ſame Electuary.

ANNOTATIONS.

AN *Aſthma* is of thoſe Diſeaſes, which are not curable in old People, but accompany them generally to their Graves, becauſe it is cauſed either by crude and cold Defluxions powring down from the Brain upon the Lungs, or by more crude and thicker Humors flowing from the Liver into the Lungs, through the Arterious Vein. Which crude, cold and flegmatic Humors in old men, do not admit of Concoction, by reaſon of the Debility of the Concoctive Faculty; which in them is feeble, becauſe of their cold Conſtitution, Age, and abundance of cold Superfluities. And therefore when they are troubled with this Malady, we are only to try how to abate it. In which caſe, the uſe of our Electuary prov'd very advantageous to our Patient.

Mercurialis, for the Cure of an *Aſthma*, highly commends a Cautery in the Arm, and long kept open. *For*, ſaith he, *we find it by daily Experience, that they who are vexed with difficulty of breathing, are mainly ſuccoured by the help of theſe Remedies.* As for Specific Remedies proper for an *Aſthma*, there are ſeveral to be found in various Authors.

Avicen preſcribes to *Aſthmatics*, that are grievouſly troubled with Difficulty of breathing, Cumin-ſeed mix'd with Vinegar, or white Muſtard-ſeed mingled with equal proportion of Honey, to the Conſiſtence of an Electuary. *Hippocrates*, to prevent Suffocation, preſcribes Quick-ſilver, the quantity of a Bean, with Ethiopic Cumin-ſeed; as alſo Sulphur beaten and diſſolved with Salt of Niter. In like manner, among the Neoterics, *Lelius à Fonte*, *Victor Favent*, *Salomon Albert*, *Quercetan*, *Beguin* and others, preſcribe Sulphur as the chiefeſt Remedy in the Cure of an *Aſthma*. Some, in caſe of a violent *Aſthma*, preſcribe Sulphur with Venice Turpentine. *Miraldus* writes, that viſcous Humors may be eaſily expectorated by ſwallowing Nettle-ſeed powdered ℈j. with any Pectoral Syrup. *Leonellus* commends Ammoniac, with a little Oxymel of Squills. Which *Ammoniac* is commended by ſeveral Phyſicians, but eſpecially by *Mercurialis*, in theſe words: But in regard *Aſthmatics* are wont to have certain Fits, with which they are more vehemently troubled, I find by Experience, that Oxymel ℥ij mix'd in a Mortar with ℥ſ. of Salt Ammoniac is a thing which gives great eaſe, a Spoonful being taken at a time. *Paulus Ægineta* commends Hog-lice parch'd in an earthen Pipkin, and then boil'd with Honey; but I uſe them without parching. The ſame Commendation *Valerius* alſo gives to *Hog-lice*, in his Notes upon *Holler*. *Your Hog-lice*, ſaith he, *that lye under Water-tubs, ty'd up in a Linnen Rag, and ſteep'd in White-wine, and the Straining given to drink, rid the Lungs of tough Humors in a ſhort time to a Wonder. Soon after*, ſays he, *to aſſwage a violent* Aſthma, *one Tablet of Diatragacanth ſprinkled with ſome Drops of Oyl of Sage, Aniſe, or Roſemary, Chymically extracted, conduces very much, and gives preſent eaſe. Cardan* writes, that Saffron is the Soul of the Lungs, and affirms that he has cured many Aſthmatics with it. I have known my ſelf the Decoction of red Colewarts given for ſeveral days with a little Sugar, give great eaſe. *Augenius* highly applauds Syrip of Tobacco; of which alſo *Monardes*, *Quercetan* and others make mention; by the uſe of which, *Zacutus* of *Portugal* writes, that he has cured ſeveral. Some there are who give Turpentine ℥ij. or iij. with Oyl of ſweet Almonds, by that means purging both the Breaſt and the Belly at the ſame time. For this Diſtemper are no leſs approved Elecampane-wine, Balſam of Sulphur, Looch of Squills, Foxes Lungs, and the like.

OBSERVATION XLV.

Pain in the Kidneys.

Nicholas of *Roſtock*, in *June*, was cruelly afflicted with ſharp Nephritic Pains, which laſted for eight days, without intermiſſion. At length, by the Advice of an old Woman, he ſwallowed twice or thrice a day, the quantity of an Acorn of new Butter, without any Salt in it; which when he had continued for three days together, at length, without any Pain, he voided a Stone, about the bigneſs, and very like an Almond, and ſeveral others leſſer, with much Gravel, and by that means was freed from his Diſtemper. Afterwards, the ſame Pain returning, taking the ſame Remedy, he voided more Stones.

ANNOTATIONS.

WHen the Stone is already fallen out of the Bladder, it is ſooneſt and beſt expelled by ſuch Remedies as ſmoothen the Urinary Veſſels, and render the Paſſages ſlippery. Such is new churm'd Butter, by the uſe of which, *John de Scherpenhuyſen* many times lyable to Nephritic Pains, frequently voided little Stones out of his Yard. Such is alſo Oyl of ſweet Almonds, either alone, or with Malmſey-wine. WVe have alſo ſeen ſome, who have frequently voided Stones by the much eating of Figs. The Decoction alſo of *Foreſtus*, by us mentioned Ob. 20. and 24. is alſo very uſeful in this caſe.

OBSERVATION XLVI.

A Wound in the Leg.

THE Wife of *Chriſtian ab Ummerſum*, having ſlightly bruiſed her Leg, and laying on a Plaiſter of her own Head, this ſlight Contuſion grew to an Ulcer, for the Cure of which, when ſhe ſent for a Chyrurgeon, after many Oyntments, Plaiſters and other Topics, for three or four Weeks applied, he could do no good. But at length ſhe was cured by an old Woman, who adviſed her to Powder-Chalk, and mix it with old Butter roaſted, by which her Ulcer was cured in a ſhort time.

OBSERVATION XLVII.

A Pain from an odd and unexpected kind of Wound. The Author would have it from Witchcraft.

John Peter Nirot, a Child, of about five years of age, for almoſt a whole Year together, had complained of Pain in the lower Part of his Belly, and was often ſo miſerably griped, that his Parents knew not what in the World to do. He had no Fever, nor was his Stomach very bad, and he went well enough to ſtool; yet his Belly was ſwell'd, and his whole Body all worn to Skin and Bones; he would rub his Noſe very much, but he ſlept very little, only ſlumber'd, and that with troubleſome and frequent Wakings. In *June*, my Advice was ſent for, I believing the Child was troubled with Worms in his

Guts, gave him ſeveral Medicaments to expel the Worms, the Crudities and Impurities of the lower Region; but all to no purpoſe, the Torments of his Belly more and more increaſing, ſo that by reaſon of his continual crying, I was afraid the Child would become burſten. At length, after ſo many Medicines try'd in vain, I felt with my hand a Hardneſs in the lower part of his Belly, in the middle, between the Navel and the Region of the Hair, ſomewhat toward the Left-ſide. This Hardneſs was alſo oblong, yet cauſed no Swelling, ſo that I could not conjecture what it ſhould be. Wherefore I ſent the Mother with the Child to a Chyrurgeon, to know his Judgment concerning the Hardneſs. He for ſome time felt the Place with his Hands, yet not able to make any right Conjecture. But perceiving the Child to be more in Pain by his handling him, the better to find out the Cauſe of the Malady, he ſqueez'd the Part affected on both ſides with his Hands ſomewhat hard, at what time, he preſently felt on the one ſide ſomething hard and ſharp, that piers'd the Skin and prick'd his Fingers. Therefore believing it to be ſome little Bone, or ſome ſuch thing, he took hold of it with a Pair of Pincers, and drew forth, not a little Bone, but, to the admiration of all that ſtood by, a large Shoo-makers Awl; after which, the Child grew very well. This Awl was about half the length of a man's middle Finger, ſuch as the Shoo-makers uſe when they ſow on their Polony Heels, without any Handle, only to the End next the Handle, there ſtuck a piece of Shoo-makers Wax'd-Thread, with which it had been formerly faſtned to the Handle.

ANNOTATIONS.

THere was no Perſon that could judg this to be a preternatural Malady. For it is not probable the Child could ſwallow ſo long and large an Awl, without any harm, and without any bodies knowing of it. But grant it had been ſo, there is no reaſon can be given, how the Awl ſhould be carried through the Membranes of the Stomach or Inteſtines, the Peritonæum and Muſcles of the Abdomen, and ſo athwart to the Skin, the Bowels untouched, and without any Exulceration; inſomuch that the Patient was cured, as it were, in a Moment, after the drawing out the Awl, and was living ſeven years after to our knowledg. And therefore it is very probable that it was put into the Body of the Boy by diabolical Incartation; like to that ſame Story which *Longius* tells of a Country Man, who had an Iron Nail which appeared under his Skin without any Prejudice, which was cut out by the Chyrurgeon; and when he was dead, four Knives, two iron Files, Hair and other things were found. And ſeveral other remarkable Stories of the ſame nature are related by others, as *Foreſtus*, *Codronchius*, *Gemma*, *Zacutus*, &c.

'Tis true, it has been a Controverſie for ſeveral Ages among Divines, Lawyers, Phyſicians and Philoſopers, whether there be any Inchanters or Witches, and whether they have ſo much Power by their Charms, to hurt the Creatures, to cauſe Sickneſs and Death, clear up Rain, and cauſe Thunder, *&c.* For a brief Solution of this Queſtion, in ſhort, we muſt conclude, that there are Inchanters, who by the Permiſſion of God, can do very ſtrange things; ſeeing that the Scripture teſtifies, that *Pharaoh*'s Magicians in *Moſes*'s time were ſuch a ſort of Inchanters, who turned Rods into Serpents, Rivers into Blood, *&c.* Thus St. *Luke* makes mention of *Simon Magus*, who made the People mad with his Magic Arts. Whence we muſt of neceſſity conclude, that there are Witches and Sorcerers, who by their Demoniac Arts, cannot only work various Miracles, but alſo blaſt Herbs and Fruits, and do miſchief to Beaſts and Men; which Miſchiefs however they cannot do when they pleaſe, nor to all that they pleaſe, but only when, and in what manner God pleaſes, and to ſuch whoſe Faith God has a Will to try, as he permitted the Devil to exerciſe his Sorceries upon

Job.

Job. Or to ſuch, whoſe Incredulity or Impiety he has a mind to puniſh, not only in the proper Perſon of the Tranſgreſſor, but alſo by giving the Witches Power over their innocent Children, their Flocks, Herds, Fruit, *&c.* And thus, by the Incantation of Witches, many times Infants, Oxen, Sheep, Horſes, Fruit, *&c.* are miſchiefed, as we ſaw at a certain Country-mans at *Montfort.* Yet, though there are ſuch Inchanters and Witches, their Power of doing Harm is not at their own, but at the diſpoſal of God. Nor can *Satan* inflict Diſeaſes, but by the Permiſſion of God, and then his Witches are but his Inſtruments, not the primary Cauſe.

OBSERVATION XLVIII.

Of the Gout in the Knee.

A Little Son of *Thomas Peters*, an Engliſh Merchant, about ſix years of age, being troubled with the Gout in his Knee for three or four Weeks, at length his Pain was ſo great that he could not go. There was no Tumor, no Inflammation, nor Diſlocation, and therefore, after I had purged his Body, I only laid on a Cere-cloth of *Oxicroceum*, which lay on for three days without any benefit. Afterwards his Knee ſwell'd very much, and the Pain likewiſe encreaſed; wherefore, leaving off the Cere-cloth, the following Cataplaſme was laid on for four or five days together, ſhifting it twice a day. The Uſe of which, cleared the Child both of his Swelling and Pain, nor did they afterwards return.

℞. *New Goats-dung* ℔. j. *Boil it in ſtrong French Wine* q. ſ. *to the conſiſtence of a Cataplaſm; and when you take it off from the Fire, add Spirt of Wine* ℥iij. *Mix them for a ſoft Cataplaſm.*

ANNOTATIONS.

THis Cataplaſm has a very great diſcuſſing and corroborating Faculty, which is look'd upon by ſome as a great Secret in theſe ſorts of Tumors of the Joynts; the ſignal effects whereof, we have try'd in many other caſes of the ſame nature. This Dung boiled in Oximel *Ætius* highly commends, as a Medicament which he has often ſucceſfully uſed in long continued Tumors of the Knee.

OBSERVATION XLIX.

A Swelling in the Fore-head, by reaſon of a Fall.

A Young Son of *Dimmer de Raet*, Conſellor to the Court of *Boxmer*, had fallen down a Pair of Stairs upon his Fore-head, whence enſued a Swelling in his Fore-head to the bigneſs of a Hens Egg. To this I only applied green Graſs freſh gathered and bruiſed in a Mortar, cold as it was; which done, the Swelling vaniſhed the next day to that degree, that there was not the leaſt ſign of it remaining.

ANNOTATIONS.

THeſe Swellings, though ſome make nothing of them, yet if they be neglected at the beginning, they are many times the cauſes of great Miſchiefs, which we ſaw happen'd to the Child of *Monſieur Armſtrong*, who having ſuch a Tumor in his Fore-head, when it could not be diſſipated by no Topics, the Place affected, continued ſwell'd for ſome Weeks after, till at length the Humor therein beginning to putrifie, and from thence bad Simptoms appearing, there was a Neceſſity not only of a Tormenting Inciſion, to open the Tumor and let out the putrid Humor, but alſo of ſcraping off the putrid Humor, corrupted with the ſame Putrefaction from the Bone that lay underneath, by which means, that imminent danger was to be removed from the Patient, to which alſo the Wound was conſolidated without any conſpicuous Scar. Wherefore it is far better to diſſipate the Humors at the beginning, at what time it may be eaſily done, and which we luckily did with Graſs only bruis'd. Many times we have likewiſe applied brown Paper moiſtned in Spirit of Wine, with as good ſucceſs, or Oyl of Wax or Aniſe, anointed upon the Place.

OBSERVATION L.

The Chollic Paſſion.

Monſieur Starkenburgh, Collonel of the Regiment of *Groening*, about forty years of age, of a cold and flegmatic Conſtitution, in *September* was taken with a violent Cholic Paſſion. His Belly was very much ſwell'd with Wind, which he could neither void upward nor downward, and terrible Gripings ſeemed to dilacerate the Guts. He complained alſo of an extraordinary Anxiety of his Heart, with which he was ſo much oppreſſed, that he was all over of a cold Sweat; but becauſe he ſeemed to be almoſt ready to burſt with Wind, and had need of preſent Relief, I preſcribed the following Gliſter, which was given him about eleven a Clock at night.

℞. *Emollient Decoction* ℔j. *Elect. Diaphœnicon, Hiera Picra* ʒj. ſ. *Oyl of Dill and Camomil, an.* ʒj. *Common Salt* ʒj. *Mix them for a Gliſter.*

This Gliſter he voided within a quarter of an hour, without any Eaſe, neither Wind nor Excrement following; for which reaſon, ſoon after we gave him another of the ſame, which did him as little good. At the ſame time the Patient growing Stomach-ſick, threw up ſome Choler with tough Flegm. Therefore about ſix a Clock in the Morning, I preſcribed him another Gliſter after this manner.

℞. *Emollient Herbs, leſſer Centaury, Wormwood, Rue, Flowers of Cammomil, Dill, an.* m. ſ. *Seeds of Aniſe and Lovage an.* ʒij. *Cummin, Laurel-Berries, an.* ʒj. ſ. *Boil them in common Water* q. ſ. *to* ℔j. *In the Straining, gently boil Flowers of Senna,* ʒj. *Then preſs them, and add Elect. Hiera Picra, Diacatholicon, an.* ʒj. ſ. *Oyl of Cammomil and Dill, an.* ʒj. *Common Salt* ʒij. *For a Glyſter.*

After he had taken this, there came away with it much Excrement, and much Wind. Afterwards, being ſick at his Stomach, he threw up a great quantity of Choler and tough Flegm, which gave him much Eaſe. Twice the ſame day he took Chicken Broth boil'd with Barley

Barley cleanſed, Citron and Orange Peels, and for his Drink, ſometimes he drank Ptiſan, ſometimes ſmall Ale. In the Evening this Bolus was given him, which cauſed him to ſleep a little the Night following, and gave him very great Eaſe, and the next day he had three Stools.

℞. *Of our Anticholic Electuary* ʒj. *Tranſparent Aloes* ℈j. *Mix them for a Bolus.*

This Bolus, afterwards he took thrice a day, every other day. The ſeventh of *October*, not having gone to ſtool in three days, upon forbearing his Bolus, his Cholic Pains increaſed again. But then, becauſe the Gentleman would not admit of any more Gliſters, I gave him a gentle purging Draught, which cauſed him to void much Choler and Flegm upward and downward. The twelfth of *October*, his Belly being bound, he took a Gliſter. The thirteenth, Dr. *Harſcamp*, an eminent Phyſitian, was called to Counſel, and then, by common Conſent, to ſtop his Vomiting, we gave him at two times, one Spoonful of Cinnamon-water, with two Drops of Oyl of Cinnamon, and ordered the following Ligament to be applied to the Region of his Stomach.

℞. *Oyl of Nut-megs ſqueez'd, of Laurel, an.* ʒj. *Of Dill, of diſtilled Fennel, an.* ℈j. *Of Aniſe Drops iij. Mix them for a Ligament.*

In the Evening he took the forementioned Bolus. The ſixteenth of *October*, he took another Gliſter, which gave him three Stools with great eaſe. The twentieth, to looſen his Belly, we preſcribed him Pills made of tranſparent Aloes only, of which, he ſwallowed two or three every other day, or every other three days; which Pills wrought ſo well, that afterwards we had no need of any other Purges. The twenty eighth, I gave him ʒj. ſ. of our Anticholic Electuary, wherein I had mingled ʒj. ſ. of tranſparent Aloes, of which he took Morning and Evening ʒſ. or ℈ij. to his great Advantage. For it ſtrengthned his Stomach, diſpell'd the Wind, and cleanſed away the Flegm and Choler. This Electuary he afterwards uſed as a preſervative, taking his Aloes-Pills in the intervening days. And by this means he recovered his former Health.

ANNOTATIONS.

THE Cauſe of this Cholic Paſſion was a great quantity of ſalt Flegm ſticking to the Guts, and an overabounding quantity of ſharp excrementitious Choler; for the Choler being voided out of its Bladder into the Guts, and being there mixed with that Flegm, and cauſing that ſalt and tough Flegm to boil, (like quick Lime thrown upon Water, or Oyl of Vitriol powred upon powdered Crabs Eyes) begat an extraordinary Flatulency, violent Pains, and extream Anxieties. That this was the true Cauſe, appeared by his vomiting, which brought up yellow and greeniſh Choler, with tough and frothy Flegm, as I have often obſerved in my Practice. Wherefore in this caſe, there is need of a hotter Medicament, in regard of the cold Flegm and the Wind; at the ſame time, to cleanſe away the Choler, and aſſwage the Gripes. To which three Purpoſes, the foreſaid Electuary, mixed with Aloes, was of great uſe; other general and neceſſary Medicaments being given as occaſion ſerved.

To aſſwage the Pains of the Cholic, many notable Remedies are preſcribed by various Authors, which are to be varied according to the variety of the Cauſes

Cauſes. In a cold Cauſe I make uſe of my own Anticholic Electuary with good ſucceſs, the Compoſition of which, is this.

℞. *Specier. Diagalangæ, Roſatum Aromaticum an.* ʒiij. ſ. *Diambra* ʒiij. *Maſs of Storax Pills* ʒiij. ſ. *Treacle of Andromachus* ʒiij. ſ. *Mithridate of Damoc.* ʒiiij. ʒv. *Oyl of Aniſe* ʒij. ℈ij. *of Cloves* ʒj. *of Nutmegs diſtill'd* ʒj. ſ. *Syrup of Stocchas* q.ſ. *For an Electuary.*

This Electuary ſometimes I uſe alone, ſometimes with every ounce I mix ʒj. or ij. of Aloes, and ſo given, have found it much more prevalent againſt the Chollic. *Holler* boils in odoriferous Wine, one ſmall Handful of common Wormwood with ʒij. of Cummin-ſeed. He alſo commends Orange-peels boil'd in Wine, and the Decoction drank faſting in a Morning. We have alſo given the ſame Peel powder'd and mix'd with Wine, and found it no leſs beneficial. Wormwood-wine is commended by *Ætius*, becauſe it corroborates the Belly, purges away the Choler, and prevents the Growth of it, and diſcuſſes and expels the Wind. Others boil ʒj. of Cummin-ſeed in VVormwood-wine, and give the Straining. *Raſes* approves Confection of Laurel Berries. *Avicen* preſcribes an effectual Medicament of equal Parts of Caſtor, Pepper and Aniſeſeed. Againſt the ſame Diſtemper are no leſs prevalent the Powder of Zedoary Root, from ℈j. to ʒj. Alſo the diſtilled Oyls of Aniſe, Fennel, Caroes, Dill and Zedoary given in hot Wine. The Decoction of Flowers of Cammomil, with a little Cummin-ſeed added, given in Ale or ſmall White-wine ʒiiij. or v. at a time, is a moſt preſent Remedy to aſſwage the Pains and expel the Wind. Others applaud this Carminative Water of *Schroderus*.

℞. *Flowers of Roman Cammomil* m. xxx. *cut, bruiſe and infuſe them twenty four hours in Cammomil-water* ℔ x. (*others ſay* xv.) *ſtout Wine* ℔ vj. *ſqueeze theſe very ſtrongly, and in the ſtraining, infuſe for twenty four hours more, Flowers of common Cammomil* m. xxiiij. *Preſs them and ſtrain them. In the Straining ſteep Flowers of Cammomil* m. xij *The yellow of Orange Peels* ʒj. ſ. *Pontic Wormwood* m. ij. *Leſſer Centaury, Penyroyal, Baſil an.* m. ij. ſ. *Seed of Dill* ʒiij. *Of Aniſe and Fennel an.* ʒj. ſ. *of Caroways, Cummin, Carduus Benedictus, Maries Carduus an.* ʒj. ſ. *Juniper berries* ʒj. *Laurel-berries* ʒſ. *Let them ſtand twenty four hours, then diſtil them with a Gentle Fire, in* Balneo Mariæ.

Rodoric Fonſeca recommends, as a ſingular Remedy, and a very great ſecret, ariſing from the Propriety of the whole Subſtance, the Teſticles of Horſes, which he ſays he has ſeveral times try'd in the Cure of cholical Diſtempers. Theſe Teſticles he waſhes in generous Wine, and cuts into thin ſlices and then dries them in an Oven with a gentle Heat, and keeps them for his Uſe upon occaſion, after general Remedies, he gives of theſe powdered ʒj. in Wine, three hours before any other Meat. *Zacutus* prefers the Pizzle of a Bull, as having a Wonderful ſpecific Vertue, one Scruple of the Powder being taken in Malmſey Wine, affirming, that he had cured ſeveral who were moſt cruelly tormented with that Grief, with that only Medicament. He alſo commends for almoſt as effectual the ſole drinking of Urine. In vehement Cholic Pains, *Riverius* preſcribes theſe Pills, which he has often given with great Succeſs.

℞. *The beſt Aloes* ʒj. *Laudanum Opiate* gr. iiij. *Diagridion* gr. vj. *Make ſix Pills.*

Let the Patient take theſe at a convenient time, and within an hour after they aſſwage the Pains and carry away noxious Humors. *Paræus* tells us of one, who when all other Remedies would not prevail, was at length cured with drinking ʒiiij. of the Oyl of ſweet Almonds mix'd with White-wine and Pellitory-wall-water, and then ſwallowing a leaden Bullet ſmear'd over with Quick-ſilver. This we alſo ſaw our ſelves of a Trooper, who being troubled frequently with the Cholic, ſwallowed three or four Piſtol Bullets, which coming out again, he was preſently rid of his Diſtemper.

OBSER-

OBSERVATION LI.

A Wound in the Head.

THomas *Gravener*, about ſixty years old, but a good ſtrong Man of his age, a Trooper under Captain *Conyers*, an *Engliſh* Officer, upon the fourteenth of *November*, playing with ſome others in the Lieutenants Quarters, by what Misfortune I know not, fell backward, and broke the hinder Part of his Head againſt the Pavement, which made a ſlight Wound in the Skin, which the Chyrurgeon ſlighted, and only laid ſome ſort of Plaiſter to it. But immediately after the Fall, the Trooper grew ſick at his Stomach, and had an Inclination to Vomit; beſides, he had a ſlight giddy Pain in his Head, yet not ſo, but that he walked the Streets for the three or four firſt days; but upon the ſixth day, his Face and all his Head began to ſwell very much. The twenty fourth day of *November*, and the eleventh after his Fall, about Evening, I was ſent for; I found the Patient very weak, with his Face ſo ſwell'd, that he could not open his Eyes for the Swelling, and under his Eyes were black and blew Spots. Thereupon, having examined the whole Caſe more diligently, from the beginning of the Fall, I concluded he would dye, in regard, that by the Signs, his Head ſeemed to me to be cleft, and that the Blood being extravaſated between the Meninxes and the Cranium, was there putrified; and that therefore this Blood which the Chyrurgeon ſhould have drawn out at firſt, by a Perforation of the Cranium, would be the Cauſe of his Death. The Chyrurgeons therefore that had him in Cure, Mr. *Edmunds* and his Son obſerving their Miſtake, as alſo the Troopers Wife and Friends earneſtly deſired that the Operation might yet be try'd, and notwithſtanding all my Perſwaſions to the contrary, I ſtood by while it was done. Thereupon that Evening the Hair being taken off, and a Croſs-like Inciſion made in the place affected, the *Cranium* was laid bare to a good breadth. The next day, the Tents being taken, and the Wound more narrowly look'd into, we found a long Fiſſure in the Skull, which *Cranium* was immediately trepan'd. But then we found the Blood, which the Wound had bled, ſticking to the thick Meninx, not coagulated or putrified, but altogether dry'd up, ſo that it ſtuck like a clammy Powder, the more cloſe to the Meninx and *Cranium*, which was a moſt certain Sign of Death, by reaſon that the Blood ſo dry'd, could in no manner flow forth. So that upon the twenty ſixth of *November*, he fell into a deep Sleep, and the next day he dy'd.

ANNOTATIONS.

COntuſions and Wounds in the Head are never to be made ſlight of. For ſometimes they deceive the quickeſt Eyes; ſo that ſuch as ſeem to be nothing dangerous, bring a Man into the greateſt hazard of his Life. We have obſerv'd ſome, who after the tenth, nay fourteenth and twentieth day after a ſlight Wound in the Head, have felt little or no pain, yet of a ſuddain have been taken with an Apoplexy, Convulſions, or ſome terrible Diſtemper; which contrary to expectation has ended their Days. Thus a Servant of the *Sieur Morignan*, a *French* Gentleman, falling from his Horſe upon his Head had no outward Wound to be ſeen: the firſt day his Head aked, and he was ſo very Giddy that he could not ſtand: from the ſecond to the twelfth he felt no harm, but went about his buſineſs. The twelfth day he complain'd of a Giddi-

neſs

neſs of his Head, the fourteenth about noon he fell down with an Apoplexy and within a few hours Expir'd. In the ſame manner a Servant of Captain *Lucas*, a Captain of Horſe, in a Scuffle among certain Souldiers received a ſlight blow upon the Head with a Cudgel, whence enſued a very great ſwelling, without any wound; for the firſt few days he was Giddy, after that he complained of a Heavineſs of his Head: the thirty ſecond day an Epilepſy took him; and the forty ſixth after the blow he Dyed Convulſive. *Valeriola* alſo tells a Story of a Woman that having received a very ſlight Wound with a Pot in her Forehead, for two days ſeemed to aile little or nothing. The third day a terrible Fever ſeiz'd her; her face ſwelled all over, with a Redneſs and Inflammation; ſoon after a Delirium, and Convulſion, afflicted her, to all which Evils upon the fifth day, Death put a final end. Her Head being open'd there appear'd a Chink in her Skull which was hardly conſpicuous, a very great Inflammation within the Skull, the hard Meninx ſwelled, black and blew, and covered with a great quantity of Putrefaction. In ſuch caſes therefore it is better to lay bare the Skull at firſt, and if need be to perforate, then by lingring to expoſe the Patient to mortal danger.

OBSERVATION LII.

A Fiſſure of the Skull.

PEter *ab Ewjick*, a Trooper under *Captain Conyers*, about thirty four Years of Age, being talking to the Lieutenant with his Hat off in the Yard belonging to his quarters, a Servant of the Houſe threw down out of an upper Window a peice of Wood of ten or twelve Pound weight, which fell accidentally upon the Troopers Head; Immediately the Trooper fell down Speechleſs, and was carry'd into the next Room for dead; where, for an hours ſpace he appeared ſo Apoplectic, that every Body thought he would have dy'd, at length he came to himſelf, but rav'd all that day and the next Night; the Chyrurgeon that was ſent for perceiving nothing but a ſlight ſuperficial Wound thought there was no danger, and promiſed to cure him in three or four days. However Mr. *Cooper*, not confiding in that Chyrurgeon, upon the third day deſired me to ſee him, I found him without Pain, ſound in his judgment, with a ſlight Wound in the fore-part of his Head; yet hardly Penetrating; his Eyes alſo were ſurrounded with black and blew, ſo that ſo few Symptoms appearing, the Chyrurgeon and all the ſtanders-by made ſlight of the buſineſs; But I having examined the buſineſs from the beginning, certainly affirmed that the Skull was either broken or ſlit, and therefore that it was abſolutely neceſſary to make a preforation as ſoon as poſſible, that the Extravaſated Blood might be let out, and that there was no dallying till more terrible Symptoms enſued, when Art and Induſtry would be too late; ſo that at length my Advice was followed. Firſt therefore, after we had looſen'd his Belly with a Gliſter, the ſame Evening upon the ſiniſter Bone of the *Bregma*, an Inciſion large enough was made in the form of the Letter T. and the Skull triangularly laid bare; at that time we could perceive nothing for the Blood; but the next day we diſcovered two apparent Fiſſures in the Cranium, and upon one ſide a ſmall Particle about half a Fingers length, ſomewhat depreſſed; which Particle was every way ſever'd and broken from the Bone. Therefore in the next firm Part we made a perforation with a Trepan, and took out half an ounce of Blood, which had flow'd out of the little broken Veins between the Cranium and the thick Meninx, and there had ſhelter'd

it

it ſelf; which being wiped off, we laid a little rag dipped in Honey of Roſes upon the Meninx, and having filled the Wound without ſide with dry Wooll, we covered it with Emplaſter of Betony. The ſixth of *February*, ſome little Blood came forth; but after that, none at all; in the mean time we kept his Belly looſe with a gentle Purge, thus we ordered the Wound till the twelfth of *February*, and covered his Head with a quilt of Cephalic Herbs, and other things; afterwards we began to lay the following Powder mixed with Honey of Roſes upon the Meninx.

℞. *Sanguis Draconis, Frankincenſe, Aloes, Myrrh, an.* ℈j. *Fine Barley Flower,* ℈j. ſ. *Make it into a very fine Powder.*

The eighteenth of *February*, the fleſh began to grow from the inſide of the Meninx. The firſt of *March*, the Meninx was covered with fleſh. The ſixteenth of *March*, a little Scale was ſeparated from the upper Bone of the Skull laid bare: and at the beginning of *April*, the Man being perfectly cured went abroad.

ANNOTATIONS.

THE ſuddain Conſternation of this Perſon, as it were Apoplectic was a certain ſign of the Skull being depreſs'd; which depreſſion could never have been made without a Fracture or a Fiſſure. And though for the following days the Patient felt nothing in his Head, in regard ſuch a depreſſion and Fiſſure could not happen without breaking ſome of the little Veins, it was better to open the Skull and take out the Extravaſated Blood, then to expect the Symptoms of it when Corrupted and Putrified: For a very little Blood, though no more then a dram, yet Putrifying upon the Meninx, may cauſe terrible Symptoms and Death it ſelf.

OBSERVATION LIII.

The Head-ach.

PEtronel *de Kuijck*, a Country-Woman, about threeſcore Years old, complained in *February*, of terrible Pains in her Head, as alſo of Catarrhs falling upon her Eyes, Teeth, Shoulders, and other parts; that ſhe had been troubled all the Winter, and felt a very great cold at the top of her Head, as if the fore part of her Head had been dipped in cold Water; Therefore having preſcribed her a hotter and Cephalic Diet, I Purged her with *Pill. Cochiæ* and Golden Pills, then I ordered Linnen-cloths four doubled and dipped in Spirit of Wine warmed, and gently ſqueezed to be laid over all the upper Part of her Head, and to continue ſo doing for ſome days, which done, that Diuturnal Pain, together with her Catarrhs, all ceaſed within a few days, then for prevention and preſervation I preſcribed her a Quilt to wear upon her Head,

℞. *Marjoram one little Handful, Roſemary, Sage, Flowers of Melilot, Lavender, an. one little Handful, Nutmegs, Cloves, an.* ℈ij. *Make a Powder for a Quilt.*

ANNOTATIONS.

IN theſe cold Maladies of the Brain, beſides general and internal Medicines, proper Topics are very beneficial; ſo that many times they alone, at the beginning of the Diſtemper, contribute very much to the Cure. In which caſe we made uſe of Spirit of Wine with good Succeſs; the Fomentations of which are highly commended by *Arculanus*. *Plater* commends Dill; *Foreſtus* Cammomile, however they are made uſe of in Head-achs proceeding from cold Cauſes. *Ætius* applaudes Goats dung, bruiſed and laid on Morning and and Evening. Others dry up cold ſuperfluous humors after this manner.

℞. *Millet-ſeed* ℔ j. *common Salt* ℔ ſ. *Leaves of Majoram, Roſemary, Sage, Flowers of Lavender, Melolet an. one ſmall handful, Seeds of Aniſe, Fennel, Dill, Cummin an.* ʒ ij. *Lawrel Berries* ʒiij.

Theſe being fryed in a Frying-pan, let them be put into little bags, and while they continue warm, let the head be firſt dried and then well rubb'd with them for half an hour. *Ætius* prefers Vervein with the Roots, and creeping Time, boyl'd in Oyl, for the Cure of all Head-aches proceeding from cold and thick Humors. He alſo recommends Hog-lice boyl'd in Oyl for the ſame purpoſes. *P. Ægineta* writes of a Woman who was very famous for cuing Head-aches either with or without a Fever by this means. She boyl'd the green Roots of Aſſes Cucumers, cut very ſmall, and Wormwood in Oyl, till they grew ſoft, and with this Oyl and Water ſhe moiſtened and watered the Head, and then clapt the Root bruiſed with the Wormwood upon it: Which Medicine is highly recommended by *Avicine*, who preſcribes it after this form

℞. *Common Oyl, Common-water an.* ℔ j. *Leaves of Wormwood* M. j. ſ. *Root of Aſſes Cucumers* ʒ ij. *Let them boyl together.*

OBSERVATION LIV.

A Hickup.

ANtonetta N. a poor Woman deſired me to ſee her Daughter, a Maid about twenty four Years of Age, ſhe had been troubled for ten days with a continual violent, and troubleſome Hickup, and none of the old Womens Remedies would do her any good, when I underſtood her Womb was well, I judg'd that the Malady proceeded from ſome ſharp Matter, firmly Impacted in the Tunicles of the Stomach; therefore I gave her firſt a light Vomit, which gave her three or four Vomits, but no releaſe from her Hickup. Thereupon I preſcribed her this following little Bag.

℞. *Flowers of Mint, Camomil, Dill, an.* M. *of red Roſes, Melilot an.* M. ſ. *one white Poppy Head cut ſmall, Nutmeg, Aniſeed an.* ʒj. *of Dill, and Cumin, an* ʒj. ſ. *cut and bruiſe them groſsly, and make a Linnen bag about the bigneſs of two hands breadth.*

This Bag I ordered her to boil for half an hour, in new Milk and common Water an. ℔j. ſ. and to take ever and anon a Draught of this Decoction; and after ſhe had gently ſqueezed the Bag to apply it hot to the Region of her Stomach; which when ſhe had continued to do but for one day, her Hickup left her.

AN-

ANNOTATIONS.

SAys *Hippocrates*, *A Convulſion is caus'd by Repletion or Emptineſs, and ſo is a Hickup.* But for the moſt part a Hickup proceeds from Repletion, ſeldom from Emptineſs as *Galen* teſtifies. Under the word Plenitude are comprehended alſo whatever matter ſticks cloſe to the Tunicles of the Stomach, and twiching and gnawing them with its Acrimony, whether ſharp, tough Humors, Pepper or any other thing.

A Hickup if it laſt long, is very troubleſome, but it ſeldom uſes to continue long. Yet *M. Gatinaria* tells a Story of a Doctor of Law, who was troubled with a Hickup for twelve days together: and *Foreſtus* makes mention of an old Woman that Hickupp'd many times for half a year together. To ſuppreſs this Hickupping, thoſe Medicaments are moſt proper, which looſen and remove the ſharp and biting humors from the Tunicles of the Stomach; ſuch are Vomiting Medicines and Sternutories. Hence ſays *Hippocrates*, *Sneezing frees the Perſon that is troubled with a Hickup.* But if theſe things nothing avail, and that the ſharp Matter will not be thus removed, then the Acrimony of it is either to be mitigated (thus in *Foreſtus* we read, that a certain old Woman, when no other Remedies would prevail, was cured with Looch *Sanum*) or elſe to be concocted and mitigated together. To which purpoſe a Decoction of Camomil-flowers, and Seeds of Dill, Cumin, Figs, or drinking of Malmſey or other ſoft Wine neat and pure. Or elſe the Matter is to be concocted, and at the ſame time the acute Senſe of the Stomach is ſomewhat to be blunted, and then Treacle, Mithridate, and chiefly *Philonium* are mainly contributory. Sometimes we read of Hickups cured by ſuddain Frights: and *Variola* confirms the ſame.

OBSERVATION. LV.

A Wound in the Head; and an opening of the Skull with a Trepan.

LAmbert *N.* a *Dutch* Gentleman, about twenty four Years of Age, Young and ſtrong, the ſeventh of *March*, as he was managing a ſprightly Horſe, was unawares thrown out of his Saddle, and knockt the hinder part of his Head againſt the Carriage of a great Gun, yet ſo that no Wound appeared outwardly: Preſently after his fall he fell a Vomiting, and was taken with an extraordinary dizzineſs, which ceaſing for ſome time, he mounted again and rode home. But no ſooner was he alighted in the Stable, but being again taken with a dizzineſs, he fell down upon the Flower, and his memory being as it were quite loſt, he neither knew what had befallen him, nor how he fell from his Horſe, nor where he was. At the ſame time a Camp Chyrurgeon being ſent for after he had ſhav'd off the Hair behind the left Ear, ſomewhat upward, where the Patient complained of no Pain, made a ſlight inciſion, which no way concerned the Pericranium; and the next day took about a pint of Blood out of his left Arm. The twelfth of *March*, the Pains increaſing, I was ſent for; at what time I found that the Patient complained of moſt ſharp Pains in his Head, yet there was no Fever, in the place affected, beſides the Wound, which the Chyrurgeon had made, I perceived a ſlight and ſoft Tumour; ſo that by the feeling, a Man might eaſily conjecture a depreſſion or Fracture of the Skull, the Chyrurgeon had hitherto laid on a defenſive of *Bolearmoniac*, whites of Eggs and Vinegar mixt together, for fear of an Inflammation, which becauſe it was miſapply'd in this caſe, I threw away, and ordered Linnen Cloaths four doubl'd and dipt in the following Fomentation, and gently

ſqueezed to be clapt warm over all his Head, and to be ſhifted three or four times a day.

℞. *Betony, Roſemary, Thyme, Sage, Marjoram, Vervain, an.* M. j ſ. *Flowers of Stocchas, Camomil, Melilot, an.* M. ſ. *Lawrel-berries Comin-ſeed, an.* ℥iij. *White-wine,* q. ſ. *boil them according to Art to* lbiij. *add to the ſtraining, Spirit of Wine* ℥ vj. *mix them for a fomentation.*

But in regard the Patient had not gone to Stool in four days, I gave him a gentle Purge, which gave him five Stools; the ſame Evening, after the fomentation ſeveral times applied, appeared in the place affected a Tumour about the bigneſs of half a Hens-Egg, which being perforated, there flow'd out Black Blood; therefore the next day ſending for a more skilful Chyrurgeon, I adviſed him to open the Skull. But the Patient and his Friends being extreamly againſt it, we ſtaid two days longer, till the fifteenth of *March*, which was the ninth day from the fall, by which time there appeared in the ſame place a Tumour bigger then the former, ſo that then with the Patients conſent I ordered the Skull to be laid bare about the Evening; and in regard the Wound was near the temporal Muſcle, there was an Inciſion made croſs-wiſe to the very Bone it ſelf, ſomewhat toward the hinder part of the Head, by the *Lambdoidal* Suture, preſently guſhed out a large quantity of Blood black and coagulated, which was expelled by the ſtrength of Nature, through the *Lambdoidal* Suture, which by the Inciſion we had in part laid bare, and had ſtuck between the *Cranium* and the *Pericranium*; the *Cranium* thus laid bare, and the *Pericranium* ſcraped, the Wound was filled with dry Wool; the next Night, the Pain being ſomewhat mitigated, the Patient ſlept a little, the next day the *Cranium* was Trepan'd, but ſcarce a Dram of Blood flowed out upon the opening of it, which till then had ſtuck between the *Cranium* and the Hard Meninx, and by this time was in ſome Meaſure coagulated; from thence I judged the Patient to be in great danger, when I found coagulated Blood, and believ'd there might be more which ſtill lying hid under the *Cranium* could not come forth, and for that the Meninx being gently ſqueezed, nothing followed. The ſeventeenth of *March*, a Fever ſeiz'd him; the next Night followed Convulſions, ſo ſtrong that four robuſt, ſtout Men, could hardly hold his Arms and his Thighs; Moreover he ſlept not at all, raved altogether, was very thirſty, and when Drink was offer'd him, Drank very greedily; the next day he remain'd in the ſame Condition, ſo that becauſe of his Delirium and his Convulſions his Wound could not be bound up, thus raving he both Dunged and Piſſed in his Bed, and more then that he bit off a peice of the tip of his Tongue with his Teeth; of the Pain whereof, when he came to himſelf, he very much complained; theſe three mortal Signs, the Delirium, the Fever, the Convulſions continued till the twentieth of *March*; at what time the Convulſions remitted, but the Fever, and raving contiued, that day the Chyrurgeon with a flat, obtuſe and oblong Inſtrument, which I ordered to be provided on purpoſe, compreſſed the Meninx a little, and between the Meninx and the *Cranium*, thruſt in his Inſtrument about the breadth of two Fingers, ſeparating the Meninx from the *Cranium*, by depreſſing it every way round about, to the end that if any coagulated Blood lay there concealed, it might the more conveniently be evacuated; but when he put down his Inſtrument upon the

Meninx

Meninx toward the Back-part, by chance he litt upon the place where the cauſe of all the miſcheif recided, out of which there came out about half an ounce of black Blood, purulent, and watry. The twenty firſt, twenty ſecond and twenty third of *March*, the ſame Inſtrument being every day thruſt in, a good quantity of Blood and watry, putrified Matter was brought away, in the mean time the Delirium abated very much, and the Patient took ſeveral naps. The twenty fourth the Meninx being preſſed downward nothing came out, then the Delirium was very ſlight, and the Patient riſing out of his Bed ſat two hours by the Fire, then alſo the fleſh began to grow up from the lower Bone about the Meninx in the hole of the *Cranium*; he could hardly eat becauſe of the Pain in his Tongue, of which he had bit of the tip with his Teeth; for which reaſon we gave him a proper Water to waſh his Mouth, which heal'd his Tongue again by degrees; all this while we made uſe of the fomentation preſcribed the twelfth of *March*; but then leaving that off, we clapt a Cap about his Head with Cephalic Herbs ſowed into it. Upon the twenty fifth, the Fever went off and the Patient grew much better, hitherto we had laid nothing but *Mel Roſaceum*, or Honey of Roſes mixed with a little Spirit of Wine, upon the hole of the *Cranium*, or the Meninx; but then we mixt the following Powder with the Honey.

℞. *Aloes Hepat, Sang. Draconis, Myrrh, Maſtick, Olibanum, an.* ℈j. ſ. *Barley Flower,* ℈ij. ſ. *reduce the whole into a very fine Powder.*

The twenty ſixth of *March*, he quite recovered his Sences, then again the Meninx being preſſed down with the foreſaid Inſtrument, there flowed out a ſmall quantity of white and well concocted Matter both Morning and Evening; after this day he roſe and ſate up for three or four hours, and fed well; the following days nothing of Matter came forth of his Skull; but contrary to our deſire, in four days time the hole was filled up with Fleſh, without ſide alſo the Fleſh grew every way, but too ſuddainly; ſo that we were forced many times to take it off with a ſlight Cauſtic; in regard we were to ſtay till the Bone Scal'd, at laſt in the ſixth Week a great large and thick Scale was ſeperated from the Bone: and then the Wound being filled up with Fleſh, the Patient was cured in a ſhort time; only this Inconvenience remain'd, that upon any ſuddain change of Air his Head would ake, and Wine preſently fuddl'd him.

In this Condition of Health he lived above four Years as he uſed to do. But in *September*, 1641. as he was ſporting in the Camp, well in Health with ſome other Troopers, he fell down Senſeleſs, and preſently his whole Body being contracted with a moſt terrible Convulſion, he Expir'd within a quarter of an hour; had I been there at that time, I would have opened his Skull to have ſeen whether the cauſe of his Death had proceeded from any thing of his old Wound.

ANNOTATIONS.

AS to Wounds in the Head with a Fracture of the *Cranium*, the Queſtion is, when the Separation is to be made, ſays *Albucaſis*, *If the Patient come to the three firſt days after the Wound, then the Bone muſt be taken away before the fourteenth day: if it be in the Summer, then make haſt to remove the Bone before the ſeventh, before what lyes under the Bone of the Pannicle be corrupted,*

ed, and terrible accidents enſue. Says *Avicen*, *Separation muſt not be delay'd in Summer beyond ſeven days, in Winter not beyond ten, but the ſooner the better.* *Hippocrates* allows but three days before Separation of the Bone, which is to be cut, and admits no longer delay if the weather be hot. To which *Hippocrates* ought to have added, if the Chyrurgeon be ſent for ſoon enough: for if he be ſent for late; or that the Patient and his friends will not conſent, then the Skull is to be perforated at any time, ſo there be any hopes of Life. For in a certain danger a doubtful Remedy is better then none. *For it matters not*, ſays *Celſus*, *Whether the Remedy be altogether ſafe, when there is no other.* *Horſtius* opened the *Cranium* of a certain Perſon upon the Eleventh day, and of another upon the Fifteenth. *Hildan* tells a remarkable Story of a *Cranium* perforated with ſucceſs, two Months after the Wound received; upon which the Matter guſhed out with a full ſtream, the Patient was cured. Thus in our Patients Caſe at firſt came forth mattry and watry Blood, and upon the Seventeenth day meer white Matter. *Hildan* alſo produces another Example of a Skull perforated upon the eleventh day. And *Ægineta* writes, that he knew one whoſe *Cranium* was perforated a Year after the Wound receiv'd, by which means, the Patient recovered. However he adviſes Separation of the Bone in the Winter before the fourteenth day, and in the Summer before the Seventh. In ſhort theſe Operations prove beſt at the beginning, and as *Avicen* ſays the ſooner the better. But if the beginning be over-ſlipped, it would be inhuman to give men over ſo long as there is hopes. Otherwiſe as *Celſus* ſays, *It is part of a prudent Man not to meddle, where there is no hopes at all.* Had thoſe deadly Symptoms there appeared in our Patient before the Operation, which appeared afterwards, we had never adventured it; nevertheleſs he was cured contrary to our Expectation.

Some Phyſitians adviſe ye to take great care, leaſt in the laying bare of the *Cranium*, which proceeds perforation, you make any Inciſion in the Sutures, for fear the Fibres of the hard Meninx, paſſing by the Sutures, and united with the *Pericranium*, ſhould be hurt: as if there were any ſuch great danger in that. For I have been preſent at ſuch Operations many times, and have ordered Inciſions to be made upon the Sutures, if I found it a proper place, and that the little Fibres ſhould be ſcraped off with a Pen-knife; and yet no harm enſued; and I have found by Experience, that ſuch cautions as theſe are only fit for contemplating Phyſitians, who never were preſent at ſuch Operations. Only take care of hurting the Temporal Muſcle, and that the Trepan be not ſet upon the Sutures, and the Perforation made there.

OBSERVATION. LVI.

An Opthalmy.

THE Wife of Captain *Junius* was troubled with an extraordinary Inflammation of her Eyes with great Pain, two days after two of her Maids and a Man Servant were ſeized with the ſame diſtemper, and ſaid they contracted it by looking upon their Miſtreſs; after due Purgation I laid upon the Eyes, all Night, the Yolk of a hard-boyl'd Egg, kneaded together with Womans Milk, to aſſwage the Pain, afterwards I ordered one or two drops of this Opthalmic Water to be dropt into the Eyes twice or thrice, which being duly obſerved, the Ophthalmy vaniſhed within three days.

℞. *White Vitriol*, ℈j. *Sugar-Candy*, ʒj. *Plantain Water*, ʒij. *Roſe-Water*, ʒj. *mix them together.*

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ANNOTATIONS.

GAlen numbers Blear-Eyedneſs among the Contagious Diſeaſes, and ſays it may be contracted by Contagion, like the Peſtilence or Itch. But he gives no reaſon for what he ſays. Thus *Plutarch*, *of all Diſeaſes, the Contagion of Blear-Eyedneſs* ſays he, creeps amongſt them that live together from one to another, ſo ſharp a faculty it has of affecting the Sight. Thus ſays *Ovid*,

Dum ſpectant Læſos Oculi, læduntur & ipſi;
Multaque Corporibus tranſitione nocent.

As to the Nature of this Contagion, Phyſitians are very ſilent; but who treat of it, ſeem to be of this Opinion, that Corrupt Vapours and Spirits iſſue forth from the vitiated Eye, which being carried to the Eyes of thoſe that are ſound, infect the ſame. However *Benedictus Faventinus* writes, that there is ſomething of Putrid, which Exhales from the Blear-Eyes, which infects the ambient Air with the ſame Quality, which Air being received by the Eyes of others, affects them by Contagion. Of the ſame Opinion is *Mercurialis*, that an *Ophthalmy* is therefore Contagious, becauſe the Spirits of the Eye affected are contaminated, which when they come to touch thoſe Eyes that are ſound, infect them likewiſe. But none of theſe ſeem to have hit the Mark. *Firſt*, Who can believe that ſuch a quantity of Malignant Spirits ſhould Exhale from the Eye, which is covered with a hard horny Membrane, as to infect the Eyes of thoſe that look at a diſtance. Such a Tranſpiration would dry up the Eye in a few hours. *Secondly*, Grant ſuch an Exhaling ſhould infect the ambient Air, and ſo infect the Eyes of others, why are not the Eyes of all Viſitants and Relations infected, but only of ſuch as fix their Eyes upon the Party. *Thirdly*, Why are not they infected alſo, that more curiouſly and long behold and view Blear'd-Eyes in reference to their Cure, as well as they that view Short Eyes but for a time, and only by accident? For theſe reaſons I do not believe Blear-Eyedneſs can be communicated by Contagion, but that it may be contracted ſometimes through the Conturbation of the Humors and Spirits of the ſound Eye. Which Conturbation is not occaſioned by corrupt Humors or Spirits, carryed from the Blear-Eye to the ſound Eye: but becauſe the ſound Eye beholds the Blear-Eyes with a kind of terror and abomination; which terror vehemently diſturbs the Spirits and Humors of certain weak Eyes, ſo that being rapidly mov'd and ſtirred up by that Conturbation they flow to the Eye, and their growing over hot enflame the Eyes. Which *Rabbi Moyſes* ſeems to intimate, where he ſays, *he that firſt ſees a Blear-Eyed Perſon, preſently has his Eye diſturbed, ſo that if he ſtill look more intently, the Eye is not only diſturbed, but contracts an Opthalmy.* Now I have ſaid that weaker Eyes are diſturbed; according to that of *Sennertus*, *You may know thoſe Eyes to be weak, that are bleared themſelves by looking upon another.* But ſtronger Eyes, and ſuch as are not terrify'd at the Sight, as they are not diſturbed, ſo they contract no *Ophthalmy*. So that it is the ſtrength or weakneſs of the Eye, the more or leſs averſion, which is the Cauſe that ſome Eyes are endamaged by looking, others not.

Nor is this a new, or to be admired at Opinion, when we find that Conturbations and Frights upon the ſight of frightful Objects are many times the occaſions of very terrible Diſeaſes, as we find by Experience in Women great with Child, whoſe tender Iſſue frequently bear the Marks of the Mothers Frights, and averſions of Sight. Others upon the ſight of any frightful Object having the Spirits of their Brain vehemently diſturbed, have become Paralitic or raving Mad; or upon a Perturbation of the Spirits of the Heart, have fallen into Palpitations, Syncopes, Fevers, or violent Diſtempers: What wonder then that the Spirits of a ſound Eye ſhould be in a Perturbation upon the frightful Sight of a Blear-Eye, and by that vehement Motion be heated to that degree, as to cauſe an *Ophthalmy*? If any one object that *Ophthalmies* have been Epidemical, we ſay, that Propagation does not proceed from any Contagion, iſſuing out of the affected Eye, but from that common Depravity of the Air or Dyet. Nor does it ſignifie any thing, what *Ariſtotle* affirms, That Menſtrous Women will infect a Looking-glaſs by looking upon it; becauſe it is not credible that ſuch an Infection happens

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through any Contagion iſſuing from the Eyes, but from certain corrupt Vapors which they ſend forth upon the Glaſs together with their Breath. Nor is it of any moment what Philoſophers ſay, that a Baſilisk will kill a Man by looking upon him; for which there may be other reaſons given; the *firſt*, For that many venemous Vapors exhale not only from the Eyes, but from the whole body of the Serpent, which infect the ambient Air. *Secondly*, Becauſe he that ſees that horrid Creature may be terrified and diſturbed in his Spirits to that degree, that the venemous Spirits may be eaſily drawn by that terror from the Body cloſe by, and carried to the Heart, to its extream prejudice: So that it is not the Sight, but the Terror and Conturbation, caus'd by that horrid Sight, and joyned to the venemous habit which cauſes Death; I ſay, joyned to the venemous habit; For no Man ſhall perſwade me that a Baſilisk ſeen at a diſtance can ever kill a Man with his Eye, though the ſame Man ſhould look upon him all day long. To ſay that a Baſilisk will dye, if he ſees himſelf in a Looking-glaſs, is a meer Dream, unleſs we may allow the Creature it ſelf to be ſo terrified, and diſturbed at the ſight of it's own horrid ſhape, that he dyes upon his Spirits being too much diſturbed, and over tumultuouſly crowding about the Heart. Or elſe that he is ſo extravagantly over-joy'd at the ſight of his own Image, that the very diſſipation of his Spirits kills him.

OBSERVATION LVII.

Spitting of Blood.

John Hugo Trumpeter to *Monſieur de Perſil*, having over-ſtrain'd, and conſequently over-heated himſelf with ſounding his Trumpet, ſoon after felt a kind of a dull Pain in his Breaſt, and with a little Cough began to Spit out frothy Blood but not much, and became ſo weak that he could hardly draw his Breath, neither could he ſtand or ſpeak, but was forced to lye in his Bed upon his Breaſt; he was ſo averſe to Phyſic, that he reſolved to take the Advice of no Phyſitian: But after he had lain about ſix or ſeven Weeks in that condition, and found himſelf nothing better at length upon the tenth of *March*, he ſent for me, I found him Sick without a Fever, but very weak, which weakneſs proceeded from ſome want of Breath; for he could not dilate nor contract his Breaſt at his Pleaſure; the reaſon of which Malady was, for that by his ſtraining in blowing his Trumpet, he had over-ſtretched the Muſcles of his Breaſt, and thereby ſo weakned them, that they could never afterwards be contracted, but the ſpitting of Blood, which was very much, proceeded from ſome little Vein that was broken in his Lungs. Firſt therefore I preſcribed him a proper Diet; next I Purged him gently, thirdly, I took out of the Median Vein of his right Arm, half a pint of Blood; and laſtly I applied the following Cere-cloth to lay over all his Breaſt.

℞ *Caſtor, Saffron Oriental an.* ʒ ij. *Maſtic, Olibanum, Storax an.* ʒj. *Benzoin* ʒ j. ſ. *Gum Taccamahacca, Galbanum diſſolv'd in Vinegar, Emplaiſter of Melilot, Oxocrotium an.* ʒj. *Make a Cere-Cloth to be ſpred upon red Leather big enough to cover the whole Breaſt from the Sword-form griſtle, to the* Aſperia Arteria, *as alſo to come about the ſides under the Arms on both ſides, let it be anointed with Oyl of Nuttmegs.*

Moreover I ordered a Girdle to be made of the Skin of an Elke, about a Hands breadth, with a broad Button; the Cere-Cloth was firſt laid on, and then the Girdle girt about his Breaſt juſt under the Arm-

Arm-pits, as hard as he could well endure it, and ſo Button'd. This done he preſently felt a great deal of eaſe, and fetch'd his Breath much more freely, and ſtrongly. The fourteenth of *March*, his ſpitting of Blood, together with his Cough, quite left him; this Cere-Cloth lay on a Month, by which time the Muſcles of his Breaſt were ſo cloſed, that the Patient had no need of any other Medicins, and ſounded his Trumpet again, without his Girdle, however I adviſed him to wear his Girdle; eſpecially when he told me, that he blew his Trumpet with more eaſe when he had it on.

ANNOTATIONS.

THIS Patient would ſwallow nothing but only a Laxative Medicament, which made me fear he would fall into a Conſumption; for beſides his ſpitting of Blood, his ſtrength was ſo waſted, that he could not ſit upright in his Bed, but was forced to lye upon his Back. But when I found that weakneſs proceeded meerly, from a defect of Motion in the Inſtruments of Reſpiration, I recovered him contrary to the expectation of all Men, by the ſaid Cere-cloth and Girdle. Nor was the leaſt part of the Cure to be aſcribed to the Girdle; for ſo ſoon as I had bound his Breaſt tite, he could ſit up in his Bed, and fetch his Breath much more freely.

Many of theſe Trumpeters ſtriving to out-vie one another, ſtrain themſelves in their Sounding to that degree, that often-times they become Burſten, or ſpit Blood, and many times crack the Thread of their own Lives. As we ſaw in *November* 1641. at what time one of Captain *Bax's* Trumpeters, ſtriving to out-do the reſt in Sounding, broke a great Vein in his Lungs, which bled in ſuch abundance that within two hours he Expir'd.

OBSERVATION LVIII.

An Hyſterical Suffocation.

Richerda, a Maid, belonging to the Lady of *Naſſau*, was troubled with a vehement Hyſterical Suffocation accompany'd with a grumbling in her Belly, and ſometimes with Vomiting and raving talk, ſhe ſaid ſhe contracted this Diſtemper by ſitting in a cold Houſe of Office expoſed to the Wind, which ſhe received up into her Body. The ninth of *January*, becauſe ſhe was bound, I gave her a gentle Purgative, which gave her five Stools; upon which day ſhe was clear of her Fit; But the next Night her Fit was more violent, and the next day very greivous; the Fit went off very well with the Smoak of Partridge Feathers held to her Noſe; beſides that, we gave her a Ball of *Aſſa Fætida*, made up with *Caſtor* and *Galbanum* to hold in her hand, and ſmell to ever and anon; toward Evening two hours before her Grand Fit, ſhe fell into ſuch Deliriums, that ſhe talked idly, and had ſeveral Inclinations to Vomit, but nothing came up, but what ſhe had eaten or drank before; the Fit went off again with the Smoak of Partridge Feathers, and the following Emplaſter was applied to her Navel,

℞. *Caſtor* ℈j. *Benzoin* ℈j. *Oppoponax, Sagapen diſſolved in Vinegar an.* ℈ij. *mix them and ſpread them upon a peice of Leather of a hands breadth.*

I gave her alſo an Hyſterical draught; but that ſhe brought up again within an hour. The eleventh of *January*, ſhe took the following Apozem ever now and then.

℞. *Roots of Maſterwort, Valerian, Dittany an.* ℥iij. *Leaves of Mug-wort, Peny-royal, Feverfew, an.* M. j. *Seeds of Lovage, Wild Carrots* ℥ij. *Common-water* q. ſ. *Boyl them to a pint and a half.*

All that day ſhe took of this, and never vomited; but without any benefit; her deliriums and ravings returned by Intervalls, toward Evening I gave her this Powder in a little Ale,

℞. *Caſtor* ℈ ſ. *Oriental Saffron*, gr. v. *Trochiſchs of Myrrh*, ℈ ſ. *make them into Powder.*

All this did no good; therefore the twelfth of *January*, when the Symptoms began again to appear I gave her only ℥j. of Yellow Amber prepared and pulveriz'd with a little Ale; which Powder when ſhe had taken, within an hour all the Symptoms miraculouſly vaniſhed; but in the Evening when ſhe began to perceive ſome fore-bodings of her Diſtemper, the ſame Powder was given her again, and ſo ſhe ſlept quietly all the next Night, the thirteenth and fourteeeth when ſhe perceived any grumbling in the lower part of her Belly, ſhe took the ſame Powder again Morning and Evening, which quite recovered her.

ANNOTATIONS.

AMber is ſaid to be a prevalent Remedy in Hyſterical Diſtempers by a peculiar Faculty; the effect of which when I found by this Experiment, I made uſe of it again with great ſucceſs in the like Caſes. The Smoak of Patridge Feathers is very effectual alſo in the time of the Fit, of which I alſo made uſe upon the like occaſions with the ſame good fortune. With theſe Feathers *Foreſtus* freed a Hyſteric Woman from her Fits, when all other Remedies fail'd, as he writes himſelf, and therefore he always kept them by him, as being endued with an occult quality for that purpoſe. *Gradus*, *Bottonus*, *Riverius* and Others commend the ſame, beſide that it is a Remedy well known among the Women. Moſt Phyſitians extol the Smoak of Hair, Horns, Old Shoes and Rags burnt, and held to the Noſe. *Galen* and *Priſcian* commend the ſmell of Rue; and the ſame Effects are produced by Galbanum, Caſtor, Aſſa Fætida, and ſuch like ſtinking Smells held to the Noſtrils. *Leonellus* compounds a Ball of Caſtor ℥iij. Aſſa Fætida, Galbanum an. ℥ij. Wax. q. ſ. to incorporate them. *Among all the Remedies*, ſays Bottonus, *that, that ſooneſt recals Women out of their Fits is a Fumigation of the Powder of Wens, that grew upon Horſes Legs, dryed in a hot Oven, burnt upon the Coals and held to the Noſtrils.* This Powder is commended alſo by *Augenius* and other Phyſitians. But though theſe ſtinking and loathſome Fumigations, tryed by common Experience, and by *Galen*, *Avicen*, and other Famous Phyſitians, are made uſe of, and extolled as the beſt and moſt preſent Remedies in theſe Uterine Suffocations, yet there are ſome who utterly reject and diſapprove them. Thus *Cleopatra*, and *Moſchio* diſparage them as vain and frivolous. *Capivaccius* writes, that they do very ill, who at firſt make uſe of Frictions and Fumigations; for he would have the whole Body firſt Evacuated, and in the firſt place the Uterine Parts. *Duretus* writes, that ill Smells nothing avail in Suffocations, that proceed from Menſtruous Suppreſſions, or Suppreſſion of the Seed, but do more harm then good; which *Mercatus* alſo affirms: But that they are only proper, when the Womb moves of it ſelf to the Liver, and ſticks to it. However with their good leave, this Opinion ſeems very repugnant to the Doctrine of *Hippocrates*, whom in all Uterine Suffocations preſcribes ſtinking things; but for the lower Parts recommends ſweet Fumes, as alſo the Fumes of Caſtor and Fleabane. As for the Suffocation when the Womb aſcends voluntarily

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to the Liver, 'tis hardly credible there ſhould be any ſuch thing in Nature; For the Womb never moves of it ſelf, but when it is forced by ſome manifeſt Cauſe, as Menſtruous ſuppreſſion, refrigeration, corruption of the Seed or the like.

OBSERVATION LIX.

Loſs of Appetite.

Mr. *Hare*, an *Engliſh* Gentleman about Thirty Years of Age, having for ſeveral days together, contrary to his cuſtom, fed exceſſively hard, and by that means diſturbed the Functions of his Stomach, and collected many crudities therein, loſt his Stomach to that degree, that for a fortnight together, he could ſcarce eat any thing at all, at length by my advice he took this Vomit;

℞. *Green-leaves of Aſara-Bacca*, ℥iij. *bruiſe them, and preſs out the juice with* ℥ij. ſ. *of the Decoction of Radiſh, add to the expreſſion Oxymel with Agaric* ℥j. *mix them for a Draught.*

This cauſed him to Vomit ſtoutly, afterwards I ordered him to eat three or four Mouthfuls of candied Elecampane Root, three or four times a day, to obſerve a warm Diet, to abſtain from Immoderate eating, to drink generous Wine, but in a leſs quantity, and after Dinner and Supper, becauſe his Stomach was very moiſt, to eat a bit or two of a raw Salt Herring, and by this means he recovered his Stomach again within a few days.

ANNOTATIONS.

Loſs of Appetite ſometimes proceeds from a hot Cauſe, as a hot Diſtemper of the Stomach, a Fever, abundance of Choler, and then it is cured with Choler purging and Refrigerating Medicines. Sometimes it proceeds from a cold diſpoſition of the Stomach; which happens either through weakneſs of the innate Heat, as in old Men, or through bad Dyet; and thence Crudities collected in the Stomach; or elſe by reaſon of cold humors flowing from the Head, or other Parts to the Stomach. Now in every cold Diſpoſition of the Stomach, by reaſon of the weakneſs of the Concoctive faculty, many crude, flegmatic, moiſt and cold humors are collected in the Stomach, which weaken the heat of the Stomach, and diſſolve the ſtrength of it, and blunt the Senſe of Attraction and Suction. In the Cure of this Diſtemper, to clear the Stomach from the filth of Crudities, Vomits are mainly neceſſary. But if other Purgatives are to be made uſe of, *Hiera* Pills are chiefly commanded by *Galen*. Then a Dyet is to be obſerved upon things of good juice and eaſie of Digeſtion, hot and dry, not fat or oily, which take away the Sence of Suction. The uſe alſo of moſt hot things, Galingale, Calamus Aromaticus, Roſemary, Marjoram, Hyſop, Sage, Lawrel-berries, hot Seeds, all Spices and the like, all generous Wines, and more eſpecally Wormwod-Wine, Spirit of Wine is commended by all, either ſimple, or diſtilled off with Juniper-berries, Seeds of Aniſe, Caraways, Fennel, Cinnamon, or Cloves: all Hippocras and Cinnamon Water ſublimated out of Wine. *Matthiolus* extols his own *Aqua Vitæ*, which is uſed by many Phyſitians, *Levinus Lemni* above all extols Ginger, either dry or condited, to help Concoction, reſtore the Appetite, diſpel Wind, and conſume Crudities. Others are for ſwallowing ſome few Pepper-corns, either whole or cut into three or four pieces. I have obſerved in my Practiſe, that the Roots of Elecampane alone, ſo condited, that they ſtill retain their bitterneſs, are more effectual than all the reſt; by the uſe of which I have made thoſe who have loſt their Stomachs, in a ſhort time, in a few days

very hungry. I alſo uſed to give them pulverized with ſtrong Wine, and have found them anſwer Expectation. For they warm the Stomach, yet not too much, conſume Crudities, promote Concoction, corroborate, open, dry and diſpel. Salt meats alſo very much excite the Appetite; So that I have obſerved that the eating of a third or fourth Part of a Pickled Herring after Dinner or Supper has recovered a loſt Stomach, if the Perſon be not very old; for it extreamly drys and corroborates the Stomach: For though a Herring be hard of Digeſtion when it is boyl'd or broyl'd, yet taken out of the Pickle and eaten raw, it is eaſie of digeſtion.

OBSERVATION LX.

A Superfœtation

THE Wife of *Dionyſius N.* a Souldier living at *Nimeghen* in *October* 1637. was brought to Bed of a Boy luſty and at the full time, which ſhe Nurſed her ſelf, after ſhe was Delivered, her Terms came down in due order, and ſhe was indifferent well all the time of her lying in, like other Women, after her Month was out, ſhe went about her buſineſs as before; but the ſeventh Month after her delivering being at Church, ſhe felt ſuch a ſuddain alteration that ſhe was forced to return home; where a Midwife being ſent for, her Waters came down accompanied with the throws of Delivery, and while the Women were all admiring what the matter ſhould be, ſhe was brought to Bed of another luſty ſound Child, which ſhe Nurſed with the former, and may be alive ſtill for ought I know.

ANNOTATIONS.

SAys the Great *Hippocrates*, *the mouth of the Womb of ſuch Women as are with Child is compreſſed.* And *Galen* obſerves, that if the Mouth of the Womb be ſhut, 'tis a ſign of Conception: and he ſays it is then ſo cloſe ſhut, that it will not admit the point of the ſmalleſt Bodkin. But granting all this, yet we muſt not conclude from hence, that there can be no Superfœtation though it rarely happen. For ſays *Ariſtotle*, if after Conception there be Copulation, there may be a Superfœtation; though rarely; for that the Womb though very rarely cloſes it ſelf till delivery. Thus *Hippocrates*, *thoſe Women have Superfœtations whoſe Wombs are not exactly cloſed after the firſt Conception.* He alſo gives us an Example of Superfœtation in the Wife of *Gorgias*, who Conceived a Girl, and when ſhe was near the time of her delivery Conceiv'd again. *I knew a Woman* ſays *Albucaſis*, *that was again impregnated, when ſhe had a dead Birth in her Womb.* Says *Cardan*, Superfœtation is rare, yet ſeen at *Millan* in our time. Says *Dodonæus* Superfœtation is very rare, yet there has been an Example of it in the Wife of a very honeſt Man. And *Plater* gives us two Examples of Superfœtation.

But now granting Superfœtation, the Queſtion is how the Superfœtation can be brought to perfection, *Ariſtotle* ſays, that if after the firſt Conception a Woman Conceive again, the Superfœtation may be nouriſh'd; but if the firſt Conception be grown, then the ſecond proves Abortive. Which is the Opinion of *Hippocrates Plinie*, *Dodonæus*, *Bauhinus* and others. Reaſon alſo ſeems to agree with Experience, which teaches us that the firſt Conceiv'd, and firſt increas'd, draws the chiefeſt part of the Nouriſhment to its ſelf, by which means the latter Conception muſt be depriv'd of Nouriſhment, and conſequently dye and be expell'd as an Abortion. But if the laſt Conception draws ſufficient Nouriſhment, and be ſufficiently perfected, and do not prove Abortive, it is impoſſible it ſhould be ready ſo ſoon for delivery as the former; and yet it will be delivered in time: as we find by this Example, by me recited, for the rarities ſake. Yet *Nicholas* tells ye a greater

Wonder:

Wonder; *I knew*, ſays he, the Wife of *Zachary de Scarparia, who brought forth a Male Child, and three Months after that was delivered of another Boy, and both lived in good Health.* Therefore we muſt conclude, the laſt Conception had Nouriſhment enough in the Womb, and was ſtrong, and conſequently able to retain it ſelf in the Womb, during the delivery of the other, in regard the Woman's Labour was eaſie and without any violence.

OBSERVATION LXI.

Worms in the Head.

THE Son of a certain Treaſurer of *Juliers*, a Young Lad about twelve Years of Age, from his Child-hood had been always troubled with Worms in his Head, at length his Mother by the advice of a Quack, waſhed and daubed his Head with I know not what Lotions and Oyntments, and ſo the Worm was kill'd; by which the Mountebank thought to have got himſelf a great name in the Town; but within a few days after the Boy began to complain of a Pain in his Head, which every day increaſing at the Months end was ſo intollerable, that I was ſent for, but all to no purpoſe; after tryal of all external and internal Medicaments; at nine Weeks end, Epileptic Convulſions ſeiz'd him, which in a few days turned to a vehement Epilepſie, which afflicted him at firſt every day, then every hour, then every quarter of an hour, at length the Child died; his Head being open'd, the Hard Meninx was all over of a red Colour, and very Black in that part next the upper-part of the Head, ſomewhat toward the the left ſide, this being diſſected, there came forth a Blackiſh and watry Goar, which had lain between both the Meninxes; the ſubſtance of the Brain was very little altered: but in the Ventricles of it there was a kind of greeniſh Humour, watry, yet not very clammy, but the quantity very ſmall, in other things there was no alteration.

ANNOTATIONS.

IN this manner it was that theſe Worms were cured by this Mountebank; However he was wiſe in this, that upon Notice of the Boys Death, he ſneaked out of *Nimeghen*; perhaps afraid I ſhould upbraid him with the Death of this Patient; like an *Ignoramus* as he was, who had ſtopp'd up the way, by which Nature voided the noxious Excrements of the Brain before he had made any diverſion.

OBSERVATION LXII.

A Tertian and Intermitting Fever.

THE Wife of *Monſieur de Spieck*, a ſtrong Child-bearing-Woman, the ſecond Week after ſhe was brought to Bed, found her ſelf very well; but truſting too much to her ſtrength, got out of her Bed, walked about the Chamber, and eat a bit of a dry'd Neats-Tongue; but at the end of the third Week, ſhe was ſeiz'd with a violent double Tertian Intermitting Fever, with an extraordinary Heat, continual Waking, her Stomach quite loſt, unquenchable Thirſt, with ſeveral other bad Symptoms. The twenty ſecond of *Auguſt*, I was ſent for, when I found her very anxious and weak

and

and in the midſt of her ſecond Fit; which moſt People thought would have carry'd her off. I gave her preſently Bezoar Stone ℈. ſ. Confection Hyacinth ℈j. with ſix Drams of our Treacle-water, which as ſhe ſaid ſoon after gave her ſome eaſe; to quench her Thirſt I gave her this Julep, which pleaſed her ſo well that ſhe drank nothing elſe all the time of her Diſtemper.

℞. *Waters of Carduus Benedict. Succoury, Borage, an.* ℔ß. ſ. *Syrup of Limons* ℥j. ſ. *Violets* ℥j. *Oyl of Sulphur* q. ſ. *to make it grateful to the Pallat.*

Toward the Evening I preſcribed this Infuſion which ſhe took the next Morning.

℞. *Leaves of Senna well cleans'd* ℥ ſ. *Rubarb the beſt* ℥j. ſ. *Rheniſh Tartar, Anniſeed an.* ℥j. *Succoury water* q. ſ. *Steep them all Night; the next day boyl them gently, then preſs them ſtrongly, adding Syrup of Roſes Solutive* ℥ ſ. *For a Draught.*

This gave her four Stools which brought away much ſtinking Excrement, and gave her great eaſe; after the Purge I preſcribed her Chicken-Broth with Sorrel and Chervil boiled together in it, with a little juice of Citron, to reliſh it, and to quench her Thirſt ſtill gave her the Julep before mentioned. The next Night ſhe ſlept indifferently, and when ſhe waked found her heat much abated, the next expected Fit was ſo ſlight, that ſhe was hardly ſenſible of it; nor did the Fever after that appear any more, being vanquiſhed by theſe Medicins only.

ANNOTATIONS.

CHild-bearing Women not careful of themſelves when they lye in, oft-times pay for their Raſhneſs, as this Gentlewoman did: As alſo did a Neighbour of Ours, who going abroad too ſoon fell into a continued Fever, upon which firſt a Frenzy and then Death enſued. Another of our Acquaintance the ſecond week of her Month, looking to ſoon after her Houſe Affairs, and preſuming to Combe her Head, fell into an Epilepſie, upon which a Delirium enſued; which Maladies though at length they were much abated, yet could they never be cured all the while the Gentle-Woman lived.

OBSERVATION LXIII.

A Bleeding at the Noſe.

THeodore *Bijl* about fifty five Years of Age, in *Auguſt* about four a Clock in the Morning, was taken with a Bleeding at his right Noſtril: Three hours after, being ſent for, for revulſion I ordered the Chyrurgeon to open a Vein in his right Arm with a large Orifice, and to take away ten Ounces of Blood; which done, by applying cold Water to his Neck and Forhead, the Bleeding was ſtay'd; three days after, being invited to a Feaſt where he drank Wine a little too freely, upon his return home, he was again taken with the ſame Malady, and bled all that Night before I was ſent for; the next day I ordered him to be let Blood as before, but to no purpoſe; nor durſt we repeat Blood-letting in regard of his Age

and

and his ſtrength, nor would he permit any Tents to be put up into his Noſtrils; and therefore we apply'd a little lock of Tow moiſten'd with this mixture to his Forhead;

℞. *Bole Armoniack* ℥ij. ſ. *Bloodſtone, Maſtick, Frnkincenſe, Red Coral an.* ℈ij. *The white of one Egg. Vinegar of Roſes* q.ſ. *mix them together.*

Moreover Oxocrate, which is actually cold, was applied to his Neck, Forehead and Teſticles, and Revulſions by Ligatures and Painful Frictions of the extream Parts, and by Cupping Glaſſes applied to his Shoulders, which avail'd nothing; at length, after the bleeding had contiued above thirty ſix hours, and the ſtrength of the Patient, through loſs of Blood was very much exhauſted, then he was forced to admit of Aſtringents to be thruſt up into his Noſtrils; therefore when we had cleanſed his Noſtrils from the clotted Blood, we ordered a Powder of Trochiſchs of Myrrh, of Bole-Armoniac, Maſtick and Frankincenſe to be blown through a Quill into his Noſtrils, and withal thruſt up a thick Tent made of Linnen about a Fingers length dipt in Vinegar, and the white of an Egg, and ſprinkled with the ſame Powder, by which means the bleeding ſeemed to ſtop for two or three hours; but afterwards the Blood began to deſcend through his Palate into his Mouth, and the Tent falling out, he bled again at the Noſtril. Then after we had once more cleanſed his Noſtril; we blew up the ſame Powder again, and thruſt up a peice of Chalk in the form of a Tent, ſo big as to fill the whole Concavity of the Noſtril; which ſtopped the bleeding preſently; however, to be ſure, we let the Chalk ſtay in three days; and ſo for this time the Patient eſcaped a moſt threatning danger; the next Year, in Autunm, the ſame bleeding took him again, for the ſtopping of which, after he had uſed a whole Day and a Night certain idle old Women's Remedies in vain; when his ſtrength was almoſt Exhauſted, he ſent again for me; and then with the ſame means of a Chalk Tent I preſently ſtopped the Bleeding as I had done before; but not long after, his Liver being refrigerated and weakned through the loſs of ſo much Blood, being ſeiz'd at the ſame time with a Dropſy and an Aſthma, he ended his days.

ANNOTATIONS.

AN exceſſive Bleeding at the Noſe, when Symptomatical, and not Critical, in regard it occaſions the Dropſie, a Cachexy, and other greivous Maladies, is to be ſtopped with all the ſpeed imaginable. This is cured by revulſion of the Blood flowing to the Noſtrils; by repelling the Blood from the Noſtrils; by thickning the Blood; and by ſhutting the opened Veins.

The beſt and ſuddaineſt way to draw back the Blood, is, by opening a Vein in the Arm, on that ſide which is affected; by which means *Galen* affirms, that he has ſuddainly ſtopped violent Bleedings at the Noſtrils. Moſt Phyſitians believe a little Orifice is beſt, and to take away the Blood in a ſmall quantity and at ſeveral times. But we are for a large Orifice, that the Blood may freely ſpin forth, which cauſes a ſwifter revulſion, Cupping-glaſſes alſo are prevalent Revulſives. Thus *Galen* ſtopped a bleeding in a Young Man by applying a Cuping-glaſs to his Hypochondriums. *Foreſtus* cured a deſperate Bleeding at the Noſe by Cupping-glaſſes applied to the foot; which Experiment we have frequently try'd with ſucceſs. Cupping-glaſſes appiy'd to the ſhoulders are not ſo well liked by many; becauſe they draw the Blood from the lower Parts to the upper. *Crato* commends the painful bending of the little-finger on the

ſide

ſide affected: of the ſame Nature are Frictions and painful Ligatures of the Extream Parts, and an Actual Cautery applied to the Soles of the Feet; by which means *Zacutus* writes, that he cured a moſt deſperate bleeding at the Noſe.

The Blood is repelled from the Noſtrils with Vinegar, cold Water, or Oxymel applyed to the Temples and Neck, or with Cataplaſms of Bole, ſealed Earth, Maſtic, Frankincenſe, Vinegar, Whites of Eggs and the like; to which may be added Plantain, Pimpernel, and other aſtringent and cooling Herbs, gathered freſh and bruiſed; Snails with their Shells mixed with Frankincenſe and Vinegar, and applied to the Forehead and Noſtrils, are much commended. *Riverius* commends Parget kneaded with Vinegar, and laid upon the Forehead and Noſtrils about the thickneſs of two Fingers. Others prefer Vinegar alone or Oxymel ſnuft up into the Noſtrils, or cold Water daſhed unawares in the Face. *Aetius* commends the Steam of Vinegar, pour'd upon a red hot Tile. Says *Pachequus*, being ſent for to a Countryman, who bled ſo exceſſively that he was juſt at Deaths door, I dropt into the contrary Ear to the Noſtril that bleed', ſome drops of Vinegar of Roſes, and preſently the Bleeding ſtopped. This I learnt from Dr. *Pontuado*, who ſaw this Remedy made uſe of by a *Dutch* Phyſitian.

Thickning of the Blood is performed by cooling, aſtringent and thickning Medicaments taken inwardly, and outwardly applied, ſuch are Oxymel and cold Water, and the repelling Medicines already mentioned. Thus *Hildan*, by wrapping the whole Body of the Party in Linnen Cloaths, dipped in Oxymel, ſtopped a Bleeding of which the Cure was diſpaired of.

The Veins are ſhut by aſtringent and glutinying Medicaments thruſt up into the Noſtrils. *Galen* mixes Frankincenſe and Aloes reduced into Powder with the White of an Egg, and with a Linnen Cloth firſt ſtrewed with Hare's Hair, put up into the Noſtrils. The Moſs that grows upon dead Mens Skulls expoſed to the Air, powdered, and put up any way into the Noſtrils, is accounted a moſt effectual and preſent Remedy. For my part I have always found the Benefit of a round piece of Chalk. Cotten dipt in Ink, and thruſt up into the Noſtrils is a very good Remedy. Hogs dung if applied while warm, or warmed with Bole-armoniac and Vinegar is accounted a Specific, if applied to the Forehead and Temples, ſmelt to, or thruſt up, into the Noſtrils; by which means I knew a Noble *German*, cured of a deſperate Bleeding at the Noſe. *Rodoric a Caſtro*, and *Zacutus* commend Aſſes-dung, uſed in the ſame manner, the Powder of Mans Blood dried, and Snails burnt with the Shells, and Frogs burnt, and blown up into the Noſtrils, is by ſome no leſs eſteemed. *Pereda* tells us of his curing an old Woman that had bled for three days, with only thruſting up Mint into her Noſtrils. The Juice of Nettles either taken inwardly, or applied to the Noſtrils, or elſe Nettles bruiſed and laid to the Forehead by a Specific Quality, ſtop Bleeding. Laſtly, *Riverius* applauds for a preſent Remedy, Spikenard finely powdered, and one dram given in Broth, Plantain, or other proper Liquor, which not only by a Specific quality, but by ſtrengthening the Liver ſtops Blood.

OBSERVATION LXIV.

The French Pox.

A Certain Captain about ſixty Years of Age, complained of a very dry Cough, which had troubled him for two or three Months together, with ſome difficulty of Breathing, and a very great Pain in his Cheſt; he had eaten very little in two Months, his Stomack was ſo bad, which had reduced him to a very low and weak condition, though he did not keep his Bed; his Head and Shoulders aked extreamely, but cheifly in the Night, he had a Pain in his Loins, he made water very often, but very little; and when he had need he muſt do it preſently; for he could not hold his water, ſometimes his Urin was very ſharp, and pain'd him in paſſing through; beſides that, it died his Shirt of a Safforn or reddiſh Colour, more

then

th en this he had found himſelf impotent for a whole Year together. By theſe Signs I judged him to be troubled with the *French* Diſeaſe; more eſpecially becauſe he confeſs'd he had been a long time troubled with a Gonorrhea, which an unskilful Chyrurgeon had ſtopped without any preceding Purgation, which occaſioned theſe Symptoms, that every day increaſed. He had alſo been pepper'd with the Diſtemper, about ten Years before; and was known to be a common frequenter of leud Company. As for the inward Pain of his Cheſt and dry Cough, I knew they proceeded from his immoderate taking Tobacco, ſometimes fifty, and when he took leaſt, thirty Pipes a day. Firſt therefore I preſcribed him a proper Diet: and among other things enjoyned him to leave off his exceſſive taking Tobacco, allowing him three or four Pipes a day, for fear the total forſaking of an inveterate Cuſtom might do him an injury, then for his Cough and the Pain in his Breaſt I preſcribed him the following Emplaſter to be laid over all his Cheſt, which in a ſhort time firſt abated, and then perfectly cured his Cough, and difficulty of Breathing, to a wonder;

℞. *Caſtor, the beſt Saffron, Nutmegs, Cloves, Storax, Calam. Bezoin an.* ℈j. ſ. *Reduce them to a fine Powder; and mix therewith Gum Armoniac, Galbanum diſſolved in Wine, Emplaſter of Melilot, Oxycroceum, an.* ℥ v. *Make a Plaiſter to be ſpread upon a thin peice of Leather.*

Before I laid on this Plaiſter, I purg'd his Body. The next day, being the twenty ſecond of *November*, I preſcribed him this Decoction, to take every Morning a good draught, and Sweat a little, and in the Evening to take another draught, but becauſe he was ſo weak, no Sweating was expected.

℞. *Lig. Guaiacum.* ℥xii. *Bark of the ſame, Salſaperil. an.* ℥iij. *Saſſafraſs-wood, Licorice ſliced an.* ℥j. ſ. *Common-water* ℔. xii. *Macerate them near the fire twenty four hours. Then boyl them in a Veſſel cloſe ſhut to* ℔. v. *Roots of Elecampane* ℥j. *Carduus Benedict.* M. ij. *Roſemary, Scordium, Bhum, Germander, Groud-Ivy, Marjoram, Centaury the leſs an.* M. j. *Stoned Raiſons of the Sun.* ℥vj. *Make a Decoction.*

The twenty eight of *November* he was purg'd again, and he took the ſame Decoction again, adding ℥j. ſ. of China-root; but he Sweat with a great difficulty, and very little, becauſe of the extremity of the cold Weather. By the fifth of *December*, the Pains in his Shoulders and Head were much abated, ſo that he ſlept quietly at Nights, and felt himſelf much better, however the ſharpneſs of his Urine ſtill continued, and a ſlight Gonorrhea; where we went on as we begun; for his Cough and weakneſs of his Stomach, I preſcribed him this Tablet.

℞. *Dry root of Elecampane* ℥ j. *Engliſh Saffron* ℈. ſ. *Calamus Aromaticus, Florence-Orrice, Benzoyn an.* ℈j. *Flower of Sulphur* ℈ij. *ſliced Licorice* ℈ j. ſ. *Reduce them in a very fine Powder; and with fine white Sugar diſſolved in Fennel-water make them into Tablets.*

The tenth of *December*, he purged with our Antipeſtilential Pills: for his Body was ſoon moved. The ſeventeenth of *December*, he took

Decoction again, which made him Sweat plentifully, becauſe perhaps the long uſe of the Decoction had made Nature more prone to Sweat; and now all the Symptoms began to vaniſh by degrees, his Appetite returned, and in regard the Patient felt no more Pain, we forbore any more Phyſic; and thus by this eaſiy courſe, the Gentleman was perfectly freed from that deteſtable Diſeaſe. But his Genitals had contracted ſuch a Debility from a long continu'd Gonorrhea, that his Venereal abilities were quite decayed, nor could be reſtored by any Provocatives whatever. The Year following 1638. in *Feburary* returning to his wonted exceſs of taking *Tobacco*, the Pain in his Breaſt, his dry Cough, and difficulty of breathing likewiſe returned, which by his abſtaining from Tobacco, and the application of the foreſaid Emplaſter were again abſolutely removed.

OBSERVATION LXV.

A Diarrhœa.

A *Dutch* Gentleman having drank in the Evening too large a quantity of new Wine, all that Night was Tormented with violent Pains in his Belly; the next day he was taken with a looſneſs, which ſeemed at firſt to give him ſome eaſe; but afterwards increaſing within two days was changed into a Dyſentery; then the Gentleman, afraid of his Life, ſent for me; I preſently gave him the following Purge;

℞. *The beſt Rubarb* ℥ij. *Leaves of Senna cleans'd* ℥iij. *Myrobolan Cheb.* ℥ij. *Seeds of Aniſe* ℈ij. *Decoction of Barley.* q. ſ. *Make an Infuſion. To the ſtraining add Syrup of Succory with Rubarb* ℥ j. *Mix them for a Draught.*

This brought away much Choleric Matter, and ſtrangely eaſed the Gripes of his Belly; the next Evening I gave him the following Sudorific, which cauſed him to Sweat much that Night afterwards he Sweat quietly, and both the Pain and the Flux ceaſed, and his former Health returned.

℞. *Treacle of Andromachus* ℥j. *Philonium Romanum* ℈j. *Of our Treacle-water, Stone-Parſly-water an.* ℥ j. *Mix them for a Potion.*

ANNOTATIONS.

MUST or new Wine, as *Diaſcorides* and *Galen* teſtifie is difficultly concocted, and begets Wind. Hence Crudities, Oppilations of the Bowels, and Griping of the Guts. Many times the exceſſive drinking of it cauſes a Suppreſſion of Urine, as it befel my ſelf once in *France*. Sometimes it begets Cholic pains; Sometimes it cauſes a Dyſentery, as it happen'd to our Patient. Hence it happens that our *Germans* little accuſtom'd to *Muſt*, when they go into *France* and ſwill it too immoderately, are troubled with Diarrheas dangerous and many times mortal Dyſenteries, eſpecially ſuch as had eaten great plenty of Grapes before.

OBSER-

OBSERVATION LXVI.

An Uterine Suffocation.

Joan Segers a Widow, in the flower of her Age, left with Child by her Husband, that dyed ſome Months before, was delivered of a Son in *Auguſt*. This Woman during her Month having been too buſie about her Houſe, in the third week was taken with an Uterine Suffocation; ſo that ſhe thought her Matrix aſcended up to her Throat; and this Suffocation was accompanyed with Murmuring and Pains of the Belly and Sides. The Woman had not ſlept in three whole days and nights, nor could ſhe either ſit or lye ſtill in a place for a quarter of an hour. I conjectur'd that theſe Suffocations proceeded from Wind or Cold receiv'd into her Body through her Womb. In the Evening therefore I gave her the following Potion, which caus'd her to ſleep a little, and put off the greateſt part of the Symptoms.

℞. *Flowers of Cammomil.* M. ſ. *Lovage ſeed.* ℥j. ſ. *Wild Carot ſeed* ʒ. ſ. *White wine* q. ſ. *Let them boyl a little.*

℞. *Of the ſtraining,* ℥ij. *Roman Philonium, Mithridate of Damoc, an.* ʒ ſ. *Oyl of Amber diſtilled by deſcent drop,* ix. *Mix them for a Potion.*

The next day, though ſhe was much better, yet becauſe the Symptoms were not abſolutely ceas'd, and for that ſhe had not gone to Stool in three days, I gave her a gentle Purge; which done, this Emplaſter was laid to her Navel.

℞. *Caſtor Pulveriz'd, Benzoyn an.* ℈j. ſ. *Galbanum diſſolved in Vinegar, Tacamahacca, an.* ʒij. ſ. *Mix them, and ſpread them upon a peice of Leather of a hands breadth.*

In the Evening going to Bed ſhe took ℈ij. of Amber powdered with a little Wine: She ſlept quietly, and heard no more of her Symptoms.

ANNOTATIONS.

Erotis in a Suffocation and Diſlocation of the Womb, commends the Root of Lovage boyl'd and bruis'd with Hogs greaſe, and laid to the Navel; but I believe the raw root bruis'd to be better. *Mercatus* recommends *Tacamahacca* or *Caranna* alone; or an Emplaſter of Great Treacle, *Angelica* and *Agnus Caſtus* ſeed. *Montagnana* extols for a great Secret, and a preſent Remedy, the following Emplaſter laid upon the Navel:

℞. *Mugwort, Feverfew, Lignum Aloes, an.* ℈. ſ. *Galbanum, Ammoniac diſſolv'd in Vinegar an.* ℥j. ſ. *Wax,* q. ſ. *For a Plaiſter.*

But he more highly applauds the following Emplaſter.

℞. *Galbanum diſſolved in Vinegar,* ℥j *Soft and whitiſh Bedellium* ℥ij. *Powder of Feverfew* ℥j. ſ. *Myrrh.* ℈j. *Mix them for a Plaiſter.*

Foreſtus affirms that a Plaiſter of Galbanum alone has done Miracles: but that he had found by daily Experience the extraordinary benefit of the following Magiſterial Emplaſter, which he ſpreads upon Leather, edg'd about with Galbanum, to make it ſtick the better.

℞. *Gallia Moſcata, Alipta Moſcata, Storax Calam. Pure Laudanum, Maſtic, an.* ʒ. *Lignum Aloes, Xylobalſamum, Galangal, Cyperus Carpobalſamum, an* ℥ij. *Red Roſes* ℥j. ſ. *New Wax* ℔. ſ. *Turpentine,* q. ſ. *Make a Plaiſter according to Art.*

OBSERVATION LXVII.

A Burſtenneſs in the Groin, with a Gangrene.

Thomas Adeler, an *Engliſh* Trooper, about ſixty years of age, had had a burſtenneſs in his left Groin for many years. In the Year 1637. in *September*, the Gut which fell down into the Burſtenneſs, being diſtended with a great quantity of Wind, hapned to break, ſo that the Ordure fell down into the void Space of the Burſtenneſs. This preſently cauſed a Gangrene of the Part, with an intollerable Stench; by which means, the Part being putrified and broken, the Ordure of the Belly came forth at that Hole, never at the Fundament. Being ſent for, though I thought him incurable, yet I ordered Spirit of Wine, with *Mel Roſatum*, and Oyntment *Egyptiacum*, to be applied to the Part, till the Gangrenous Parts were ſeparated from the ſound Parts. Then we found that the Gut was not only broken, but quite broken off the one Part from the other, and that the upper Part hung out, and gave paſſage to the Excrement. The end of this Inteſtine afterwards grew fleſhy, and acquired a kind of a fleſhy Ring, and this Ring cleaved afterwards ſo faſt to the neighbouring Fleſh; ſo that for the future, the Inteſtine remained always fix'd and open in that Part, and gave paſſage to the Excrement: So that we ordered him to carry a little braſs Pot, ſo ordered and hung, as to give him the leaſt trouble that might be; and thus, in all other Parts ſound and healthy, he walk'd abroad whereſoever he pleaſed; and in nine years, that he was forced to carry about him that troubleſome Burthen, he was never ſick.

ANNOTATIONS.

THis is a rare and remarkable Example. I never thought before that a broken Gut could grow to the adjoyning Fleſh in the Groyn, till I was a Witneſs of it in this Patient. True it is, that if a Gut happen to break among the fleſhy Muſcles of the Abdomen, ſuch a Coalition may ſometimes happen, as *Plater* obſerves: *A certain Captain*, ſays he, *being wounded in his Belly, voided his Excrements through a Pipe which was left there after the Wound was cured, and was for many years afterward alive and well. The Cauſe of which, when I examined, I found that Wounds of the Guts, if they ſeem to trace the fleſhy Portions of the Muſcles of the Abdomen, after the Lips of the Wounds of the Guts and muſcly Fleſh are glutinated on both ſides, there may be a Paſſage made for the Excrement to come forth, and be prevented from falling into the Cavity of the Abdomen; and that thoſe Wounds, although they cannot be conſolidated, yet they are not Mortal; which though very ſeldom happens, ſometimes in other Parts, as in the Bladder.* *John Hornung*, alſo a Phyſician of *Heydenheim*, tells a Story of a Country Man, whoſe right Gut, upon a Wound in the Abdomen, came forth, opened with a broad Wound; nor was it put back by the Chyrurgeon, but the Wound of the Abdomen being cured, hung out as long as the Man lived, retaining its natural Colour, yet ſomewhat more thick and more fleſhy; and through this Paſſage it was that the Excrement came always forth with an extraordinary Stench, forſaking the common Road of the Fundament.

OB-

OBSERVATION. LXVIII.

A Pining Conſumption, cauſed by a vitiated Stomach.

MOnſieur *de Naſſau*, a Captain of Horſe, in the Flower of his Age, in the Year 1637. during the Siege of *Breda*, in *September*, as he lay in his Bed all in a Sweat, hearing ſome Troops of Horſe march by his Window, leap'd out of his Bed, opened his Caſement, and ſtood looking out for ſome time; and by that time became ſuddenly overcool'd by a North Wind, at that time cold and tempeſtuous, fell into a violent Diſtemper. Preſently he complained of an extraordinary Griping in his Belly about the Region of his Stomach; he had alſo withal, a ſlight Fever, with a violent Cough, which brought up much clammy, flegmatick, ill-coloured Matter, yet without any Pain in his Breaſt. Several of the moſt eminent Phyſicians were ſent for, who by his Spittle, his Cough, and other Symptoms, concluded that his Diſeaſe was a real Conſumption, and that incurable, and told the Prince of *Orange* that he would ſuddenly dye. As for the Pain in his Belly, thoſe they unanimouſly agreed to be the Cholic Paſſion, cauſed by the ſuddain Cold. To aſſwage this Pain, which they call'd the Cholic, they uſed ſeveral Remedies for a long time, which gave eaſe ſometimes, but never cur'd, which they affirmed was impoſſible to be done. To abate his Cough, they made him an Iſſue in his Left-arm, and gave him the following Apozeme to take for many Weeks;

℞. *China Roots the beſt* ℥j. *Leaves of Scabious, Colts-foot, Betony, Pimpernel, Plantain, an.* m. j. *Cordial Flowers, an. one ſmall Handful, ſton'd Raiſins* ℥j. *Licorice ſhav'd* ℥ij. *Aniſe-ſeed* ℈iiij. *Boil them in Barley-water of the ſecond Decoction*, q. ſ. *to* ℔ ij. *For an Apozeme.*

For an ordinary Looch, they gave him equal Parts of Syrup of Poppy and Cumfrey. Alſo they preſcribed him a cold Diatragacanth in Tablets; and to looſen his Belly, they gave him this ſmall Potion.

℞. *Rhubarb choice* ℥j. *Yellow Saunders* ℈ſ. *Decoction of Barley* ℥iij. *Infuſe them all Night, and to the Straining add Manna of Calabria* ℥ſ. *For a Potion.*

This gave him one or two Stools. Now, when they had had the Gentleman two Months and a half, and all their Phyſick did no good; inſomuch that the Gentleman was reduced to Skin and Bone, and his Strength every day more and more decay'd; they would give him no more Phyſic, but gave him over for incurable. Then I was thought of, and the Gentleman was brought from *Breda* to *Nimeghen* in a Man of War. The Gentleman gave me a full Accompt of his Diſtemper, and what had been done to him, and ſhewed me the Receits that had been preſcribed him, and which he had taken: So that when I had conſidered all things, I could not be of thoſe Phyſicians Opinion. For by his Spittle and Cough, he ſhewed no Signs of a Conſumption, for though he brought up tough and ill-coloured Stuff, yet neither was it Matter nor Blood. The Pain of his Stomach was no Cholic,

Cholic, as being fixed in his Stomach, and not accompanied with Wind; but twitching the Ventricle with extream Pains, by Intervals, not wandring through the Guts. Therefore I judged the Cauſe of this Pain to be a ſalt Flegm, cauſed by the firſt ſudden Refrigeration, and adhering to the Ventricles of the Stomach, which fermenting at Intervals through the afflux of Choler, or ſharp Rhume, cauſed thoſe cruel Gripings. Other things alſo ſhewed the Stomach to be offended, as loſs of Appetite, inclination to vomit, troubleſome Belches, Crudities, *&c.* The Cough I looked upon, as cauſed by Defluctions falling upon the Lungs, which were continually fed by the crude Vapors carried from the ill affected Stomach to the Head, and thence falling down again upon the Breaſt; the Gentleman thus ſatisfied with my Conjectures, in order to the Cure, upon the twenty ſixth of *November*, I laid him on upon his Head, a Cap or Quilt of Cephalic Herbs, and other hot Ingredients, which he wore all that Winter. I ordered him a warning and attenuating Diet, Meats of good Juice, and eaſie of Digeſtion; to which Diet, I left him wholly, without giving him any other Phyſic, for three or four days, becauſe of his extraordinary Weakneſs. Within a few days, his ſtinking and ill-coloured Spittle, his Brain being corroborated by the help of the Quilt, and his Defluxions ceaſing, became white and of its natural Conſiſtence, and neither ſo much nor ſo clammy as before. The thirtieth of *November*, the Pains of his Stomach began to gripe him, not extending themſelves beyond the Region of the Stomach, yet ſo terrible, that they ſeemed to ſurpaſs the Pains of Child-bed. To aſſwage this Pain, I gave him one Dram of our Anticholic Electuary, by five a clock in the Morning, and again, at eleven at Noon; but this would not ſtir the Pain. Thereupon I applied to his Breaſt a Cere-cloth of Storax, Benzoin, Caſtor, Galbanum, all over the Region of his Stomach. The firſt of *December*, the Patient would ſwallow no Phyſic, only he took a Gliſter that gave him one Stool. The next day, he having taken *Pill. Ruffiæ*, had three Stools, but his Pain nothing abated, ſo that his Strength being extreamly waſted by the Violence thereof, we were forced to Narcotics; of which, I made choice of the hoteſt, by its heat to ſtrengthen the Stomach, and digeſt and cut the clammy cold Humors, and by its Narcotic Faculty to aſſwage the Pain. To which purpoſe, I gave him about Night one Dram of *Philonium Romanum*, prepared with *Euphorbium*, which allay'd the Pains within three hours. The third of *December*, he took ſeveral times that day a ſmall quantity of the following Conditement;

℞. *Specier. Diamoſch. Diambra, an.* ℈j. ſ. *Diagalanga* ℈j. *Roots of Calamus Aromaticus condited, Conſerve of Anthos, an.* ℥ſ. *Preſerved Nutmegs* ℥ij. *Confection of Alkermes* ℈ij. *Syrup of Limon* q. ſ. *Oyl of Cinnamon* gutt. ij. *For a Conditement.*

About Night his Pains began to return again, but not with that vehemency. The next day, taking *Pill. Ruffiæ*, he had three Stools. Toward Evening, by his Pulſe I found him ſomewhat feveriſh; but upon taking this ſmall Potion the Fever vaniſhed.

℞. *Treacle of Andromac* ℥j. *Of our Treacle-water* ℥j ſ. *Oyl of Vitriol* gutt. vij. *For a Draught.*

The

The fifth of *December*, the Pain in his Stomach was very gentle; his Cough and Spitting ceaſed; but ſome beginnings of a Fever appeared, which upon taking this Apozem vaniſhed;

℞. *Succory Roots of Aſparagus, an.* ℥j. *Of Elecampane* ℥ſ. *Herbs, Endive, Centaury the leſs, Roman Wormwood, an.* M. j. *Carduus Ben.* M. ſ. *Aniſe-ſeed* ℥j. ſ. *Currents* ℥ij. *Orange and Citron Peels dried, an.* ℥iij. *Boil them in common Water* q. ſ. *for an Apozem, to* ℔j. ſ.

In the Evening I gave him an Amigdalate, which cauſed him to ſleep, which was continued for three days, during which time, feeding now and then upon Chicken-broth, his Strength was ſomewhat recovered. All this while there was ſomewhat troubled the Patient's Stomach, which he could not well expreſs in Words, only that ſomething aſcended up now and then to his Throat; this ſpoiled his Appetite, and hindred his Digeſtion, and as the Patient believed, was that from which the Fits derived their Original; therefore to extirpate this Malady, I gave him the following Antimoniate Wine.

℞. Crocus Metallorum *of our Preparation* gr. xv. *Strong French Wine* ℥iiij. *Steep them all Night, the next Morning ſtrain them through a double brown Paper for a Draught.*

He took this Potion the twelfth of *December*, at eight of the clock in the Morning: At nine a clock he had an Inclination to Vomit, but brought up nothing; but a little after, he brought up ſome few Lumps like Glew, and of a greeniſh Colour. About eleven a clock, his Anxiety ceaſing, he had ſeventeen watry Stools, of a mixed Colour, without any Gripes; however, becauſe his Strength was much impaired, we refreſhed him with Cinnamon-water and Sugar. In the Evening, I gave him a Draught of generous Wine, with a Dram of Treacle, and ſo the next Night he ſlept indifferent well. The next day, he perceived the thing that troubled him in his Stomach to be gone, which he never felt more. From that time his Stomach began to come to him, and he eat three Porringers of Broth that day, and digeſted them well. The following days he was ſo hungry, that he not only eat three or four times a day, but ſometimes at Midnight: the two firſt days he was fed with Broths variouſly prepared; the third day, he began to eat boil'd Chickens, Lamb, Veal, *&c.* and ſometimes to drink a Glaſs of Wine; the fourth, he came to roaſted Meats, and ſo fell to his accuſtomed Diet, and ſo in a ſhort time he recovered his former Strength.

OBSERVATION. LXIX.

Nephritic Pains.

Monſieur Bronkherſt, Lord of *Werdenburgh*, in the Flower of his Youth, and a great Lover of Rheniſh-wine, was taken the twenty ſixth of *December*, with moſt cruel Nephritic Pains, not without ſome obſtruction of his Urine. Six years before, being troubled with the ſame Pain, he had voided a little Stone, but after that he had not had the leaſt touch of the Malady, nor ſo much as voided any Gravel.

To

To aſſwage the Pain, I gave him an Emollient Gliſter, then preſcribed him this Mixture.

℞. *Oyl of ſweet Almonds new drawn* ℥iij. ſ. *Juice of Limons* ℥vj. *Malmſey-wine* ℥iij. *Mix them for three Doſes, to take once in three hours.*

The following Liniment was alſo laid warm to his Loins;

℞. *Oyls of Scorpions, Lawrel, bitter Almonds, an.* ℥ſ. *Of Camomil, Dill, Turpentine, an.* ℥ij. *Mix them.*

Toward Evening his Pains ceaſed; in the Night, making Water freely, he voided a rough unequal Stone, about the bigneſs of a Pea. The fourteenth of *January*, having expoſed himſelf to the Cold in vehement Weather, his Pains returned; at what time, taking the ſame Mixture again, he voided another Stone, and was again freed from his Pains. But for the future Prevention, I adviſed him to ſwallow every other day a Pill of tranſparent Aloes, or a Bolus of Venice Turpentine, and ſometimes to uſe *Fernelius's Syrup de Althea*; but above all things, to forbear the uſe of Rheniſh-wine.

ANNOTATIONS.

THE Reaſon why Rheniſh-wine engenders the Stone, and cauſes the Gout, is the *Sal Tartar*, which is more ſharp, and four times more abounding in Rheniſh-wine, than in French or Canary, or any other Wine; which tartareous Salt, not being well digeſted in ſome Bodies, is ſeparated from the Maſs of Blood, and with the Serum, carried to the Kidneys, and ſo hardens into Stones, and being expell'd into the Joynts, cauſes moſt dreadful Torments. For the Nature of Salts is, by corroding other Bodies to reduce them into Atoms, and aſſociate to themſelves. This Corroſion is the Cauſe of the Gout; for while the tartarous Salt corrodes the nervous and membranous Parts, and endeavours to aſſociate them to its ſelf, thoſe cruel Pains are excited, which are mitigated by an Afflux of watry Humors, for Salt diſſolv'd with much moiſture looſes its Acrimony. But you'l ſay, why does not this Salt cauſe as great Pains in the Kidneys as in the Joynts? becauſe the moſt ſubtle and acrimonious part of it, is diſſolved by the continual Paſſage of the Urine, and carried away with the Urine through the Bladder; but the thick, gravelly and earthly Subſtance remains, which does not offend ſo much by its Acrimony, as by its Bulk and roughneſs. Now the reaſon why the German Wines abound with Tartar, is, becauſe the very Soil of *Germany* it ſelf, where the Vines grow, aboundeth with Tartar; nor is there any Plant which ſucks up the ſalt and tartarous Parts of the Earth, more than the Vine. And therefore it is, that in many Places of *Moravia*, *Auſtria*, *Bohemia* and *Hungaria*, where the Soil is ſuch, that moſt Men are troubled with the Gout, or Stone in the Kidneys and Bladder, or both. Laſtly, that Wine engenders the Gout, is apparent from hence, for that the Forbearance of VVine cures it. Of which, the Phyſicians bring many Examples; and *M. Donatus* himſelf confeſſes, that he was cured of the Gout by leaving off VVine for two years.

OB-

OBSERVATION LXX.

An Extream Pain under the Sternon-Bone.

Lieutenant *More*, in the Flower of his Age, in *January*, felt a moſt terrible Pain, which extended it ſelf in a right Line from the top of the *Aſpera Arteria*, to the upper Orifice of the Stomach, all along the Sternon-bone, and ſo cruelly tormented the Perſon, that he could not move himſelf one way nor other. He neither had any Cough or difficulty of Breathing; his Lungs and *Aſpera Arteria* were perfectly free; nor did his Gullet pain him in ſwallowing; neither laſtly, was there any thing to be ſeen outwardly. The Pain lay under the Sternon, where it is faſtned to the Mediaſtrinum, or in the Membrane annexed to it withinſide, which was thus occaſioned. The Patient, the Evening before, had been hard drinking a ſtrong ſort of French Wine, at a great Supper, and with that and a very great Fire all the time in the Room, had over-heated himſelf to a great degree. After which, going home at Midnight in a Sweat, of a ſuddain by the way, he was taken with a violent Cold, for it freezed very hard; hence the Pores being preſently ſhut, the hot and ſharp Vapors being condenſed and congealed, ſtuck to the inner Membrane of the Sternon-bone, which almoſt numb'd that part with the ſharpneſs of the pain, that was ſtill encreaſing by the motion of the Breaſt. For the Cure of this Malady, I looſened his Body with a Gliſter, and then preſcribed him this Sudorific to take warm.

℞. *Treacle* ℈iiij. *Extract of Carduus Ben. and Angelica an.* ℈j. *Engliſh Saffron* gr. vj. *Of Treacle-water* ℥ij. *Oyl of Aniſe* gr. iiij. *Mix them for a Potion.*

Upon this he ſweat very well, but the pain continued as before. After he had ſweat, I applied the following Cere-cloth to the place affected.

℞. *Powder of Caſtor, Cloves, Benjamin, Saffron, an.* ℈j. *Galbanum diſſolved in Wine* ℥ß. *Melilot, Oxicroceum* ℥iij. *Mix them and make a Cere-cloth to be ſpread upon Leather as long as the Part affected, four Fingers broad, and anoint the ſame with Oyl of Nutmegs diſtilled.*

After this Cere-cloth had ſtuck ſix or ſeven hours to the Part, the pain began to abate very much, ſo that the Patient could move himſelf with more eaſe. The next day he took a Purge, and had five Stools; which done, after the Cere-cloth had ſtuck on three days, the pain went quite off, and the Gentleman went abroad well in Health. But afterwards, in *February*, having over-heated himſelf with drinking of Spaniſh Wine, the ſame Cere-cloth cured him again in three days.

OBSERVATION LXXI.

The Head-ach.

PEter *Joannis*, an Ale-brewers Servant, a ſtrong Fellow, in *January*, when it freezed very hard, was taken with a terrible pain in his Head, otherwiſe ailing nothing; by reaſon of which pain, he could take no Reſt night nor day, for ſeveral Days and Nights together, which not only cauſed the loſs of his Stomach, but alſo a Delirium; nevertheleſs, the Patient was ſo obſtinate, that he would take no Phyſic, only by much perſwaſion he would admit of Topics. Thereupon, for preſent eaſe, I preſcribed the following Fomentation, with which being warm, I ordered his Head to be fomented, and Napkins four times doubled, and dipt in the Fomentation, to be laid all over his Head, and to be ſhifted as they grow cold, and this is to be continued all the Night long.

℞. *Roſemary, Vervain, Betony, Thyme, an.* m. j. *Marjoram* m. j. ſ. *Sage* m ſ. *Flowers of Cammomil and Melilot an.* m. j. *of Dill and Stœchas, an.* m. ſ. *Seeds of Cummin and Dill, Lawrel Berries, an.* ℥ſ. *White-wine* q. ſ. *Boil them to* ℔ iij. *To the Straining add Spirit of Wine* ℥iiij. *For a Fomentation.*

The next day the pain was much abated; but in regard the Patient refuſed all manner of Phyſic, the Fomentation was continued for two days, by which time his Sleep returned, and the pain went almoſt all off, only ſome remainder of pain in his Fore-head, a little above his Noſe, with ſome Obſtruction of his Noſtrils, which proceeding from a tough Flegm, cloſely adhering to the *Ethmoids-bone*; I preſcribed him a ſneezing Medicine of the Juice of the Root of Betony, which when he had drawn up into his Noſtrils, firſt opened with a Quill, he voided from his Palate and Noſtrils a great quantity of tough Flegm, and ſo was quite freed from his intollerable pain.

ANNOTATIONS.

I Confeſs this Courſe of curing, without any Evacuation or Diverſion preceding, was not ſo ſafe; for that the flegmatic Humors collected in the Brain, and attenuated by the hot Fomentation, might have eaſily fallen upon ſome noble Bowel, not without great danger; but in regard the great abundance of Humors threatned either an Apoplexy or a Delirium, or a Lethargy, and the Intenſneſs of the Pain, a Fever, and for that the Patient refuſed to take any Phyſic, not ſo much as a Gliſter, nor would ſuffer Blood-letting, I was forced, for the prevention of greater Miſchiefs, to proceed as I did to Topics, temembring the Saying of *Celſus*, *'Tis no matter whether the Remedy be ſafe when there is no other.*

OBSERVATION LXXII.

The Scurvey.

AGnes *Alberti*, a Maid of about twenty four years of Age, complained of a dull heavy Pain in her left Side, under the Baſtard Ribs; as alſo of a certain Chillineſs of her whole Spine. She had alſo certain cold Shakings, frequent Debilities and fainting Fits, which pre-

preſently went off; beſides, ſhe had certain black and blew Spots upon her Thighs; moreover, her Teeth were looſe, and her Gums eaten away, ſhe had an ill Smelling. By theſe Signs, I judged her to have the Scurvy. But in regard it was in the midſt of a hard froſty Winter, when no proper Herbs were to be got, and becauſe the Extremity of the Cold would not permit of Purgation, I only preſcribed her this following Electuary, to take of it the quantity of a Nutmeg three times a day, and all the while to obſerve a good Diet;

℞. *Specier. Diambræ, of Aromaticum Roſatum, Seed of Biſhops-weed and Parſley, an.* ℈ij. *Naſturtium, Cremor Tartar, an.* ʒiij. *Choice Cinnamon* ʒj. *Sal Prunella* ℈j. *Reduce them into a very fine Powder. Then,*

℞. *Long fat Raiſins* q. ſ. *Boil them in Wine till they are ſoft, and ſtrain the Pulp through a hair Sieve.*

℞. *Of this Pulp* ℔ſ. *and mix the whole Powder with it, together with Oyl of Aniſe and Juniper, an* ℈j. *Syrup of Limons* q. ſ. *For an Electuary.*

I would willingly have mixed ſome bitter things, but ſhe had an Averſion to them. I adviſed her alſo, if there were any Winter Scurvy-graſs or Naſturtium to be got, to ſteep thoſe Herbs in ſmall Ale or Wine, and then to boil them gently, and to take that Decoction, deferring the reſt of the Cure till *April*; in the mean time, to fix and faſten her Teeth, I preſcribed the following Alum-water.

℞. *Powder Alum,* ʒj. *Common VVater* ʒvj. *Cinnamon-water* ʒj. *Mix them to waſh the Mouth.*

After ſhe had made uſe of theſe things a while, ſhe felt a great eaſe, and the Spots of her Thighs vaniſhed. The twenty ſixth of *April*, the following Apozem was prepared for her; of which, after ſhe had taken three or four times, and purged her Body twice, ſhe was quite freed from her Diſtemper.

℞. *Pylypody of the Oak, Rind of Caper-roots, an.* ʒj. *Roots of Fennel, Eryngos, Stone-parſley, Elecampane, an.* ʒſ. *Fumary, Dodder, Leſſer Centaury, the whole Dandelyon, an.* m. j. *Roman VVormwood, Flowers of Elder, an.* m. ſ. *Seeds of Parſley, Aniſe, Fennel, Naſturtium, an.* ʒj. ſ. *Currants* ʒij. *Rheniſh Tartar* ʒj. *Common VVater,* q. ſ. *Boil them according to Art, adding at the end, Root of wild Raddiſh* ʒj. *Herbs, Scurvy-graſs, VVater-Naſturtium, Brook-lime, an.* m. j. *To make an Apozem of* ℔ ji.

ANNOTATIONS.

MAny believe the Scurvy to be of the number of thoſe new Diſeaſes, which *Dodoneus* writes were firſt known in *Brabant*, in the Year 1556, though epidemic for ſome years before, among the *Belgians*, *Danes*, and other Northern Regions. However, *Hippocrates* deſcribes a certain Diſeaſe call'd the *Bloody Volvulus*, very like the Scurvy, if not in all things, yet in moſt, as a ſtinking Mouth, ſtarting of the Gums from the Teeth, bleeding at the Noſe, Ulcers upon the Thighs, ſome going off, others newly come, the Skin emaciated and black, Sloathfulneſs, and Inability to work or walk. *Pliny* deſcribes this Diſeaſe by the Name of *Sceleturbe*, where he ſays, that there was a new Diſeaſe in *Germanicus*'s Camp beyond the *Rhine*, which caus'd

ſhedding of Teeth, and looſned the Joynts of the Knees. But that there was a Root which was found out for it, which was called *Britannica*, good for the Nerves and Maladies of the Mouth, having a long Leaf and a black Root. For as in the *French* Diſeaſe, *Guaiacum*, *Saſſaperil*, and ſome few other things are Specific; ſo has this Diſeaſe certain proper Antidotes, as Spoon-wort, the Naſturtiums, Brook-lime, Fumitory, wild Radiſh, *&c.* with ſome other bitter things that are not purgative.

OBSERVATION LXXIII.

A Weakneſs of the Stomach.

CAptain *de Gone*, about fifty years of age, for ſome Weeks had been troubled with a Weakneſs of his Stomach, which had both loſt its Appetite and Concoction, accompanied with troubleſome Belches, and a nauceouſneſs. After I had preſcribed him a proper Diet to cleanſe his Stomach from Crudities and cold and viſcous Humors, I preſcribed him this Apozeme, to take at four times, four Mornings together;

℞. *Roots of Elecampane, Mecoacan, Fennel, an.* ℥ſ. *Calamus Aromat. Galangale, an.* ℥ij. *Herbs, Mint, Roſemary, Nipp, Marjoram, leſſer Centaury, an.* m. j. *Wormwood, Baum, Hyſſop, an.* m.ſ. *Seed of Carthamum* ℥j. *Of Fennel, Caroways, an.* ℥ij. *Raiſins ſtoned* ℥ij. *Common Water* q. ſ. *Boil them, and add toward the end, White Agaric* ℥ij. *Leaves of Senna cleanſed,* ℥j. ſ. *Aniſe-ſeed* ℥v.

This gave him three or four Stools a day; ſo that after he had thus purged, I ordered him to take an hour before Dinner and Supper, a Doſe of this Powder in a Draught of generous Wine.

℞. *Root of Calamus Arom. Specier. Diagalangæ, Diambra, an.* ℥j. ſ. *Mace, Choice Cinnamon, Ginger, an.* ℥j. *Make a Powder to be divided into ten equal Doſes.*

I adviſed him alſo in a Morning, to drink a Draught of Wormwood-Wine, and theſe few means reſtored his Stomach to its former Strength.

ANNOTATIONS.

IN cold Diſtempers of the Stomach, beſides thoſe already mentioned, Obſervation 5. 8. there are ſeveral others which are highly commended by Phyſitians. Some extol the uſe of Turpentine, and call it the true Balſam of the Bowels, in regard it gently heats, purges and cleanſes the Bowels. *Zechius* highly commends this Bolus, and ſays there is nothing better can be uſed.

℞. *Clear Turpentine* ℥j. *Maſtich powdered* ℥ſ. *Powder of Aromaticum Roſatum* ℈ſ. *Make a Bolus to be given two hours before Meat.*

Some there are that boil up Turpentine into the Form of Pills, but erroneouſly; for that the more effectual vertue of the Turpentine exhales in boiling. Balſam of *Perue* is an admirable thing to ſtrengthen the Stomach; if you take ſome few Drops of it in ſtrong Wine before Meat. *Crollius* commends his *Elixir Proprietatis*: *Hartman* and others prefer *Zedoary* before all other things. The Decoctions of *Guaiacum* and *Saſſafras* are very good. Diſtilled Oils alſo are very proper, of Cloves, Aniſe, Carroways, Cinnamon, Nutmegs, and the like, given in ſome few Drops of ſtrong Wine. The following digeſtive Pow-

der

der is alſo very much uſed to help Concoction.

℞. *Coriander prepared* ℥j. *ſweet Fennel-ſeed and Aniſeſeed, an.* ℥ij. *Cinnamon, Cloves, an.* ℥ſ. *Sugar* ℥iij. *Reduce them into Powder; the Doſe one Spoonful after Meals.*

Wormwood alſo taken any way is very much commended, as *Galen* teſtifies, who cured a Woman that had loſt her Stomach, and ſo weak, that ſhe could get no Food down, with only Wormwood-wine. *Therefore,* ſays *Montagna, among Medicines which ſtrengthen the Appetite and Digeſtion, and open the Obſtructions thereof, and cleanſe away and dries up the Matters therein contained, Wormwood is the moſt famous:* and all Wormwood Medicines, whether Julebs or Confections. *Langius*'s Electuary is alſo very proper in ſuch caſes.

℞. *Conſerve of Roſes* ℥ij. ſ. *Roſemary Flowers* ℥j. *Lavender Flowers* ℥ſ. *Galangale, Cubebs, Xyloaloes an.* ℈j. *Aniſeed* ℥ſ. *Cinnamon* ℥j. *Calamus Aromaticus* ℥ij. *Ginger condided* ℥ſ. *Pine Apples prepared* ℥vj. *Make theſe into an Electuary with Syrup of preſerved Citron.*

I reſtored a loſt Appetite, and a Stomach overwhelmed with Crudities by the uſe of this Powder.

℞. *Roots of Zedoary, Galangale, Calamus Aromat. an.* ℥j. *VVhite Ginger* ℥ſ. *Cinnamon* ℈ij. *Cremor Tartar* ℥ij. *Make a Powder, the Doſe* ℥ſ. *or* ℈ij. *in the Morning, after Dinner and Supper in a Draught of generous VVine.*

Monſieur de Spieck generally made uſe of this;

℞. *Root of Calam. Aromatic. VVhite Ginger, Galangale, an.* ℥j. *For a Powder.*

But theſe kind of Stomachical Electuaries, Powders, Tablets, *&c.* every Phyſician ought to preſcribe according to the Diſpoſition of the Patient.

Horſtius makes uſe of this Powder.

℞. *Coriander-ſeed prepared* ℥j. ſ. *Aniſe, Fennel-ſeed, an.* ℥ſ. *Ginger, Galangale, an.* ℥j. ſ. *Lignum, Aloes* ℥ſ. *Cinnamon* ℥j. *Fine Sugar, the weight of all the reſt, for a Powder.*

OBSERVATION LXXIV.

The Stone.

RUtger *Schorer*, a little Boy, had a ſmall Stone which fell down into his Bladder, with extraordinary Pain, but being afterwards expelled into the Paſſage of the Yard, becauſe it was too big to paſs, it ſtuck in the middle of the Pipe, and ſtopped the Urine. Several ways were tried in vain to get it out, ſo that at length, to add to the Pain, there appeared an Inflammation of the Part; by which we found that there was no way but Inciſion to get it forth. Wherefore, after the Chyrurgeon had pulled up the Skin ſomewhat toward the Glans, he opened the Ureter on that ſide where the Stone ſtopped, and took out the Stone, and ſo the Wound was preſently conſolidated, without any hurt to the Child.

ANNOTATIONS.

THis ſort of Operation, mentioned by *Ætius, Grumelenus* and *Paræus*, ſeems difficult and dangerous, but yet is very ſecure. *Plato* alſo recites two Examples of Stones cut out of the Ureter. And though ſome are afraid of a *Fiſtula* upon ſuch a Wound, yet I never knew any ſuch Conſequence.

OB-

OBSERVATION LXXV.

Nephritic Pain.

THE Son of Lieutenant St. *George*, about eighteen years of age, who had been always troubled with Gravel from his Infancy, and had often voided little Stones, in *January*, was ſo tormented with a Stone that ſtuck in both Ureters, that he knew not where to turn himſelf: For Cure I preſcribed him this Apozem,

℞. *Roots of Fennel, Saxifrage, an.* ℥ſ. *Licorice ſcraped* ℥vj. *Herbs, Althea, Mallows, an.* m. j. *Cammomil Flowers,* m. j. ſ. *Cleanſed Barley* ℥j. *Seeds of wild Carrots, Mallows, Nettles, Burdock, an.* ℥j. *Four greater Cold-ſeeds, an.* ℥j. ſ. *Fat Figs* n° ix. *Dates* xi. *New Milk, Common Water equal parts. Boil them and make an Apozem to* ℔iij.

This being taken the ſame, and the next day, the Pain ceaſed, after he had voided a ſmall Stone and much Gravel.

The next Month he was troubled with the ſame Pains, but then, by taking the ſaid Decoction, the Stone was eaſily brought down through the Ureters into the Bladder; but then, when it came into the Yard, it was ſo big it could not paſs, but obſtructed the Urine with moſt cruel Torture, which the Father not being able to bear, there being no Chyrurgeon to be ſent for, with a Razor, made a ſmall Wound underneath the Urinary Paſſage, where the Stone ſtuck; which done, the Stone ſpurted out, and the Urine followed in great quantity. The Wound was conſolidated afterwards, ſooner than we imagined, with the Application of a few Plaiſters.

OBSERVATION LXXVI.

Milk in a Virgin's Breaſt.

A Certain Noble young Lady, about twenty years of age, a Virgin of eminent Chaſtity, in the Month of *February*, complained of a Pain in her right Breaſt, which was alſo full of Milk. When I had diligently examined the place affected, I felt a hardneſs in the middle of the Breaſt, about the bigneſs of a Pidgeons-egg, which pained her upon Compreſſion: I alſo underſtood from her ſelf that her Purgations had been ſuppreſſed for four Months together. In order to the Cure, I preſcribed her firſt a convenient attenuating Diet; then, after I had purged her Body, I gave her ſome Apozems to move her Evacuations, and three or four days before the time of the Period, I opened a Vein in the Heal, by which means, the Evacuation ſucceſſfully enſued, which having continued three or four days, the Swelling in her Breaſt fell down, nor did any more Milk come forth. However, in regard the Hardneſs remained with ſome Pain, I laid this Oyntment ſpread upon Linnen, upon the place affected, ſhifting it once a day;

℞. *Honey, Populeon Oyntment, Virgins Wax, an.* ℥j. *firſt melt the Wax, then mix the reſt, and ſtir them with a* Spatula *till they are cold.*

This

This Topic very much abated, and within four days the hardneſs came to Suppuration. After the Apoſtem was broken, and had caſt forth much white Matter, within a few days the ſame Topic cured her.

ANNOTATIONS.

CErtainly had not this Lady been a Perſon eminent for her Chaſtity, ſhe might eaſily have incurred the Scandal of loſt Virginity among the Vulgar. For rational Phyſicians will not deny, but that upon menſtruous Obſtructions, Milk may ſometimes be generated in the Breaſts of Virgins. *For*, ſays *Hippocrates*, *if a Woman, that neither is with Child, nor ever brought forth, has Milk, that Woman labours under a Suppreſſion of her Courſes.* And I remember the ſame Caſe in a young Lady of *Montfort*, whoſe Chaſtity was above the reach of Scandal, who was cured upon the forcing down her Purgations: To which purpoſe, *Bartholin* thus writes, *Even in Virgins, many times Milk may be generated, if the Breaſts are full of Sperituous Blood, and that there happen withal a menſtruous Suppreſſion, in regard the glandulous Subſtance concocts more than is neceſſary for the Nouriſhment of the Woman.* But 'tis no wonder that ſuch things ſhould happen in young Virgins that have their Flowers, when it is known that the ſame thing happens to old Women. For *Bodin* reports a Story of an Infant, that ſucking a dry old Woman upon the Death of her Mother, at length drew Milk out of her Breaſts, and was nouriſhed with it to ſufficiency. Nay, I have ſeen Milk more than once milked out of the Breaſts of Infants not above two years old; which is alſo atteſted by *Cardan* and *Camerarius*. But more wonderful it is, that Milk ſhould be generated in the Breaſts of Men; as *Ariſtotle* teſtifies of a certain *Lemmian* Slave; and *Abenſina*, who ſaw Milk milked from the Breaſts of a Woman, enough to make a Cheeſe. Several other Stories alſo there are in ſeveral other Authors, of Men giving Milk, too tedious to relate.

OBSERVATION LXXVII.

Epileptic Convulſions.

A Little Son of *John ab Udem*, an Infant of ſeven Months old, was twitched with Epileptic Convulſions, almoſt, without intermiſſion, for two days together, ſo that nothing but Death was expected. The third day I was ſent for, preſently I ordered this Quilt to be prepared and laid upon his Head.

℞. *Leaves of Marjoram, Vervain, Roſemary, Flowers of Melilot, an. one ſmall Handful, Nutmegs* ℈j. ſ. *Cloves* ℈j. *Make a groſs Powder to be quilted up in red Silk.*

After this had lain four or five hours upon his Head, the Convulſions ceaſed by degrees, and within twelve hours vaniſhed quite, to the Admiration of all, that the Child ſhould be ſo ſoon freed from ſo deſperate a Diſtemper.

ANNOTATIONS.

IN regard the Brains of Children are very moiſt, and that thence ariſe many watry and flegmatic Vapors; Nature, for their more eaſie Evacuation, leaves the Skull open for ſome time at the top of the Head. But as this Opening gives an eaſie Exit to the Vapors, ſo if the Head be not well covered, to prevent the entrance of the external, Cold then upon ſhutting the Pores, and the Refrigeration and weakning of the Brain, the Vapors being detained therein

therein, condenſe into a tough Slime in the Ventricles of the Brain; which Burthen, when Nature cannot throw off, thence ariſes Epileptic Convulſions, which procure the Death of many Infants. Or if they ſcape with Life, they either become Changlings, or retain ſome other terrible Misfortune as long as they live; as ſome Paralytic Member, Blindneſs of one Eye, *&c.* However this Diſtemper differs from a true Epileſie, in regard the Convulſions in this Malady are leſs vehement, though more frequent and of longer continuance: Beſides, that theſe Convulſions proceed from abundance of Humors, and weakneſs of Concoction and Expulſion in the Brain; but the true Epileptic, from the Malignity and the Envenomneſs of the Humors. Nevertheleſs it has been known when the Humors ſo collected in the Brain, if the Diſtemper have continued long, by degrees have acquired a malignant Quality, and indeed a malignant Quality into the Brain and Meninxes, and then theſe Convulſions become the moſt grievous of all Epilepſies.

The Cure of this Diſtemper conſiſts chiefly in corroborating and warming the Brain, to the end the Pores may be opened, and the Vapors have free exit; which being done in time, I have known many that have eſcaped the Diſtemper. Some endeavour an Evacuation of the Flegm at the Noſe and Mouth, by thruſting up Oyl of Amber and Roſemary into the Noſtrils. But when the Brain is become ſo weak through the extraordinary quantity of Flegm that overlays it, that it cannot contract it ſelf, that way of Cure does little good, or rather more harm, as cauſing ſtronger Convulſions, while the enfebled Brain is forced to more vehement Expulſion. Therefore it is much more expedient to warm and corroborate the Brain, and by that means to promote the Concoction of the crude Humors, and to evacuate the Vapors through the Brain, not yet conſolidated: Which done, the Brain is ſufficiently able to concoct and diſſipate the reſt of the Slime which adheres to the Ventricles, and to expel it through the Paſſages appointed for that Evacuation. To which purpoſe I have often found a Quilt lay'd upon the top of the Head, to be very prevalent; for it anſwers all Expectations, it warms and corroborates the Brain, it opens the Pores, and powerfully promotes the Concoction and Diſſipation of the Crude Humors. Sometimes before I lay on the Quilt, I anoint the top of the Head with a drop or two of Oyl of Marjoram. Sometimes I order the Patient to take a ſpoonfull or two of the Water of the Flowers of Lilly of the Valley, and Syrup of *Stœchas*, two parts of the firſt, and one of the latter. I have alſo obſerved, that if Infants wear theſe Quilts till their Heads are firmly conſolidated, they are not only free from this, but many other Maladies of a cold Brain. *Nicholaus Fontanus*, in this caſe highly extols Childrens Urine, and tells a Story of a Patient to whom he gave three Glyſters with ſucceſs, of the Decoction of proper Herbs boiled in Urine, and then gave him to take, a Syrup of Childs Urine, made up with various Cephalics.

OBSERVATION. LXXVIII.

An Intermitting Tertian Ague.

Joſeph Wenties, a young Man, in the beginning of *March*, was taken with an Intermitting Tertian Fever, which ſeized him with an extraordinary ſhaking, and went off with a violent Sweat: Within a months ſpace he had made uſe of a hundred ſeveral Remedies of old Women and Mountebanks, Purges, Vomits, and Topics to his Wriſts, not forbearing Charms and Amulets to hang about his Neck; all which were ſo far from abating the Fever, that after the beginning of *April*, it grew ſtronger every day than other. Upon the ſeventeenth of *April* I was ſent for; I found the Patient very weak, his Stomach quite gone, and ſo lean, that his Skin could hardly cover his Bones. He had taken a Vomit the day before, and therefore I thought it not proper to purge him any more. Wherefore, after I had preſcribed him a proper Diet, I gave him an opening and refrigerating Apozeme, which he drank three days together, but without any benefit. Thereupon

upon I ordered the following Mixture for a bag to be hung up in a Veſſel of White-wine.

℞. *Leaves of Carduus Benedict. Leſſer Centaury, Wormwood, an. two ſmall handfuls, Lucid Aloes,* ℥ij. *Cut the Herbs ſmall, and bind them together in a bag to be hung in* lb v. *of White-wine, and ſometimes to be ſqueezed out.*

Of this bitter Wine he drank a draught of ℥iiij. or v. the firſt day twice, but afterwards once a day; this gently purged him, and brought the Diſtemper to a ſimple Ague; and then it abated every day; and this drink being continued, in a ſhort time went quite off leaving the Patient reſtored to a very good Stomach.

OBSERVATION LXXIX.

A Baſtard Intermitting Tertian.

THE Lady of *Naſſaw*, in the Flower of her Age, but lean and ſqueamiſh, was ſeized by an intermitting Tertian, that came every other day, but no certain hours, ſometimes latter, ſometimes ſooner, accompained with pain in the Head, Nauſeating, Anxiety of Heart, and ſeizing with an extraordinary ſhaking, but going off with a violent Sweat; her Stomach was gone and ſhe ſlept very little; and in regard ſhe was very thirſty, ſhe would drink ſix or eight Pints of Water during her Fit. Upon the twenty fifth of *April*, at the beginning of her cold Fit I was ſent for, at what time to make her ſweat the ſooner, I preſcribed her this draught.

℞. *Salt of Wormwood, Extract of Carduus Ben. Confection of Hyacinth, an.* ℥j. *Treacle-water,* ℥j. *Mix them for a draught.*

The next day, not willing to a Purge, ſhe took a Gliſter only, which gave her two Stools; after which, ſhe took no more Phyſic for four days. *May* the firſt, I preſcribed her a refrigerating and opening Apozem, which ſhe drank up in two days; her Ague ſtill continuing in the ſame ſtate; thereupon becauſe ſhe abhorred the taſte of Phyſic, I gave her the following Vomit which when ſhe took, ſhe thought ſhe had drank Wine.

℞. *Crocus Metallorum, gr.* xvi. *White French Wine* ℥iiij. *or* v. *Steep them all Night, and the next day ſtrain them through brown Paper.*

This draught ſhe took the ſixth of *May* in the Morning, about nine ſhe began to Vomit, without much trouble at firſt; but at length ſhe brought up a whole Chamber-pot full of Yellow green Choler, mixt with a tough and Flegmatic Slime: and her Vomiting ceaſing, ſhe had alſo two or three Stools: but ſtill the Ague continued in the ſame condition; but then I preſcribed her a Magiſterial Wormwood-Wine in this manner.

℞. *Carduus Benedict. Leſſer Centaury, VVormwood an. two ſmall handfuls Lucid Aloes,* ʒj. *Cut the Herbs ſmall and hang the mixture in a long bag in a Glaſs Veſſel filled with* ℔ viij. *of ſmall white French or Rheniſh Wine*

Of this Wine ſhe drank four Ounces Morning and Evening for the firſt two days,but afterwards, becauſe it gave her three or four Stools a day, no more then only once a day, that is to ſay in the Morning; the fourth day, through the uſe of this Wine the Ague became ſimple, much milder and ſhorter, and from that time abating by degrees, upon the eighth day left her quite; however for more certainty I ordered her to continue the Wine for four days longer, which gave her two Stools a day: and thus both her Appetite, and her ſleep returned,and ſhe recovered her loſt ſtrength in a fewdays.

ANNOTATIONS.

AT this time intermitting Baſtard Agues were very riſe about *Nimeghen* and the neighbouringParts,obſtinate and of long continuance, in ſome ſimple, in others double. Phyſic ſeldom cur'd them, ordinary helps nothing avail'd; nor would Blood-letting do any good. Some felt a ſlight Pain in the right Hypochondrium: ſome Vomited great ſtore of Choler of their own accord: ſome were troubled with Head-aches, others with anxiety of Heart; all were very thirſty, during the Fit; very Cold and Shivering at the beginning but intenſely Hot at the end. That the Cauſe of this Ague proceeded from the Excrementitious Choler putrifying in the Follicle of the Gall and neighbouring Parts, the very Signs, and the Fever it ſelf, ſufficiently declar'd. Somtimes the Cauſe of the Diſeaſe being Evacuated by Vomits, the Diſeaſe ceas'd: ſometimes neither Vomits nor Purges would avail; for that though they purged away a great quantity of Choler, yet they left ſome remainders of the corrupt Choler behind, to which new Humors flowing were Infected with the ſame Corruption. Blood-letting nothing profited, becauſe the Seat of the Diſtemper lay neither in the Veins or Blood.Refrigerating Medicaments could not ſubdue the Choler, becauſe they could hardly reach thither,in regard the Follicle attracts that one which is moſt bitter and hotteſt in the Blood. Upon theſe Conſiderations I thought that the Cure of this Diſeaſe required ſome cleanſing, opening, bitter and moderately hot, and that in a thin and liquid ſubſtance: that by reaſon of its liquidneſs it might be able to penetrate the Meſaraic Veins more eaſily, and by reaſon of its heat and bitterneſs be more eagerly drawn by the Follicle; and be more effectual to concoct Crudities, remove Obſtructions, reſiſt Corruption, cleanſe the part affected, and expel Noxious and Superfluous Humors. To anſwer all which expectations, I thought nothing better then the foregoing Wormwood-Wine, with which I have Cured ſeveral without any other Remedies. Nor let any one wonder that I give Wine inFevers contrary to the Opinions of all the Ancients: for that the Ancients meant ſimple and not Medicated Wines, ſeeing that both *Galen* and ſeveral others both Ancient and Neoteric Phyſitians recommends Wormwood-Wine in Agues. Some queſtion whether Medicaments prepared with Wormwood are proper in exquiſite and Baſtard Tertians; *Trallian* allows them in Baſtard, not in Tertian Agues; and with him *Avicen*, *Oribatus*, and *Amatus* of *Portugal* agree. But ſays *Galen*, *If the ſigns of Concoctions appear, then thou mayſt ſafely Adminiſter Wormwood-Wine; which is otherwiſe a Soveraign Preſervative of the Stomach, when moleſted by Choler.* To decide the Queſtion therefore I ſay that Wormwood is not leſs proper in Exquiſite, then in Baſtard Agues, eſpecially after Concoction in regard it potently cleanſes Choler, and Purges as well by ſtool as Urine: for which reaſon it muſt of neceſſity abate an Ague by removing the Evil Matter that Feeds the Diſtemper: and that therefore the heat and draught of it ought not to be fear'd, eſpecially if it be given with other refrigerating things; in regard that the Choler being remov'd, the heat will ceaſe.

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OBSERVATION LXXX.

The Cholic Paſsion.

PEter *Galman*, a *German* Merchant, in *March*, the weather being cold and rainy, had the hap to Travel along with me; at what time not being able to heat our ſelves by riding the exceſſive cold brought upon him a moſt vehement Cholic paſſion; ſo that he could no longer ſit his Horſe; alighting therefore at the firſt good Inn, we came to, we warm'd our ſelves by a good Fire, and apply'd warm Cloths to his Belly to mitigate the pain; but the pain increaſing more and more, for want of other Medicaments, that were not there to be had, I took of common Sope and White-wine of each ℥j. and after I had warmed them very hot over the Fire, I added ℥j. of Spirit of Wine. In this mixture I dipped a Linnen-cloth doubl'd fourfold, about a hands breadth, and apply'd it hot to his Navel, and by that only Topic freed him from his Pain within a quarter of an hour.

ANNOTATIONS.

BEſides ſeveral Remedies againſt a Flatulent Cholic to be given inwardly, there are various Topics which being outwardly applied are of ſingular Vertue, as we found by this quick and ſucceſsful Experiment. In this caſe there is an Oyl of Sope, the Extraction of which *Sennertus* teaches us in his Inſtitutions, that it is very prevalent, nor is Oyl of *Galbanum* leſs effectual. *Galbanum* alſo it ſelf diſſolv'd in Wine or *Aqua Vitæ*, then mixt with *Caſtoreum*, and applyed like an Emplaſter to the Navel, as alſo *Caranna* and *Tacamahacca* diſſolved with Spirit of Turpentine, are of ſingular Efficacy. *Holler* prepares this Liniment of Civet; Which he ſays, he has often tryed.

℞. *Oyl of Rue, Nard. an.* ℥vi. *Galbanum diſſolved in Aqua Vitæ.* ℥iij. *Melt them together, then add Civet* gr. iij. *Saffron* gr. vj.

Horſtius anoynts the Navel with Treacle mix'd with a little Civet. And it is not amiſs to apply warm to the Belly equal parts of Common Salt and Sand tyed up in a Linnen Bag. The Ophite or Serpents ſtone heated and applyed is alſo in great eſteem among the Vulgar. Little Bags alſo of Flowers of Dill, Cammomil, Melilote, Cummin, Aniſe, Fennel ſeed and the like, ſprinkl'd with warm Wine, or gently boyl'd in Wine, and applyed hot to the Belly. One thing more I may add concerning Sope, which a Mountebank in *France* was ſaid to have Cured ſeveral Perſons of the Wind Cholic: his Secret was this.

℞. *Malmſey Wine* ℔j. *Spaniſh Sope* ℥ſ. *or* ℥vj. *and ſometimes alſo an.* ℥. *Salt* ℥ij. *Diſſolve theſe altogether for a Glyſter.*

OBSERVATION LXXXI.

An Obſtruction of the Spleen.

JUſtin *de Naſſau*, a Noble Youth about ſix Years of Age, about the end of *April*, began to be troubled with an obſtruction of his Spleen; which within a Fortnight encreaſed to that degree, that the hard Spleen bunched out almoſt half as big as a Mans Fiſt; when I came I felt the Boy's Spleen with my hand, and perceived the

Child otherwiſe chearful, then grown Melancholy like an Elder Perſon; but in regard he loath'd Phyſic, I only preſcribed him a proper Diet, and ordered him only 3 ſ. of Tartar Pulverized every Morning and Evening in a little Broth; I alſo order'd the following Emplaſter to be laid upon his Spleen, which after it had lain on ten days, and then but once ſhifted, the hardneſs vaniſhed, and the obſtruction was diſſipated;

℞. *Gum Ammoniac, Galbanum diſſolved in Vinegar, an.* ℥j. *Emplaſter of Melilot,* ℥iij. *Mix them and ſpread them upon red Leather.*

OBSERVATION LXXXII.

A Suffocation of the Womb.

Godefrida ab Eſſem, a Woman about thirty Years of Age, had been troubl'd with an Uterin Suffocation, for which ſhe had taken in vain ſeveral things that had been given her by Midwives and other Women; her Fits increaſing I was ſent for, and found her ſomewhat red in the Face, but altogether ſenſeleſs, only ſhe breath'd and that but very little neither. The Woman cry'd out her Womb was got up to her Throat, which was Impoſſible; but indeed I felt a certain hardneſs in the upper Region of her Stomach, that moved up and down from one ſide to the other, about the bigneſs of a Mans Fiſt; therefore becauſe ſhe was not in a condition to ſwallow any thing, I ordered her Temples and the inſide of her Noſtrils to be rubbed with Oyl of Amber diſtilled by deſcent. Then I ordered the Midwife with her middle Finger ſmear'd with three or four grains of Civet, to fret the ſides of the Matrix within ſide, while another Woman with all her ſtrength forced down the hardneſs: and thus within a quarter of an hour, the Woman after ſhe had ejected a putrid ſort of Seed, came to her ſelf again, nor had ſhe ever after any more Fits.

ANNOTATIONS.

THat ſweet Odours applyed below draw down the Womb, not only the Authority of Authors, but Experience tells us. Therefore *Galen* ſays that perfumes which heat and looſen, do good, becauſe they heat. Thoſe that heat, attenuate alſo and looſen, by which means what is thick, and difficultly moveable is eaſily Purged out through the open Pores: Moreover that they have a faculty to diſpel Wind, which is very troubleſome in Uterine Suffocations. *Ægineta* adviſes the pouring of moſt Odoriferous Oyntments into the Womb: and *Ætius* would have the Womb fumigated with Spices that have a faculty of looſning, ſwearing, and expelling Wind. However care is to be had how you hold theſe ſweet Odours to the Noſe, leaſt you encreaſe the Suffocation by oppreſſing the Head. In this caſe ſome Phyſitians make uſe of many ſweet Scents; but for my part, I only make uſe of Musk mixt with a little Oyl of Lillies: and many times order a Woman to fret and ſtillate the inſide of the Orifice with Musk only, which has produced wonderful Effects. Frication with the Finger alone helps to a miracle, and is, commended by *Galen*, *Avicen*, *Valeſco de Tarenta*, *Simon Betreino*: though indeed there is nothing like preſent Copulation, where it is to be done with allowance; ſo that indeed for a Woman in the ſame Condition with our Patient, there is no ſuch Remedy as a Husband. Thus *Duretus* being call'd

to

to a Woman under a Hyſterical Suffocation and finding her in a Fit as cold as Ice, and her Husband by, order'd him to have to do with her, which he did, and the Woman preſently recovered.

OBSERVATION LXXXIII.

An Eryſipelas, or St. Anthony's *Fire in the Thigh.*

MOnſieur *Kelfken*, *Conſul* of *Nimeghen*, had an *Eryſipelas* in his right Thigh, with which he had been formerly often troubl'd; he was threeſcore Years of Age, and had a very foul Body. He had laid upon the *Eryſipelas* Linnen rags dipt in Vinegar, and Water of Elder-berry Flowers, which ſomewhat abated the *Eryſipelas*, only certain little Bliſters roſe up here and there, as he was wont to have when he uſed the ſame Vinegar and Water before; upon theſe Bliſters after he had prickt them with a Needle, he laid a Leaf of green Tobacco; but after it had lain on for three or four days the Skin was more and more exulcerated, and a certain gangrenous Particle began to appear; upon which the Gentleman ſent for a Chyrurgeon; who eaſily cut out that gangrenous Part, ſticking in the Skin; and then endeavoured, with various Plaiſters, to cure the ſolution; anointing the whole Thigh, becauſe of the *Eryſipelas* with *Galens* refrigerating Oyntment; and this courſe he took for ſix Weeks; but when he could do no good I was ſent for; I found the Patient full of watry and Flegmatic Humors, which falling Salt upon his Thigh, cauſed that continual Exulceration: this made him looſe of Body, and his Stomach was indifferent, but he had ſuch an Averſion to Phyſic that he would ſwallow nothing; when I look'd upon his Thigh, I found the Plaiſters were the cauſe of the Exulceration of the Neighbouring Parts; which by reaſon of their Fatneſs and Denſity they were not able to retain or ſuck up the Salt and ſharp Humors flowing into them, the Humors were forced to flow to the Neighbouring parts, which they corroded; therefore deeming it the beſt way to perform the Cure with Cataplaſms, which by reaſon of their ſoftneſs, might ſuck and dry up the flowing Humors, I preſcribed the following Cataplaſm without any Oylineſs or Fatneſs.

℞. *Pomegranate Rinds, Flowers of Pomegranates, an.* ℥j. *Leaves of Oake, of Plantain, Egrimony, Sanicle, an.* Mij. *Pimpernel, Flowers of red Roſes, an.* Mj. *common water,* l. iiij *boil them to the Conſumption of half.*

℞. *Leaves of Oake,* M. iiij. *of Egrimony, Plantain, an.* Mj. ſ. *Powder them together; then ada Bean Flower,* ℥ij. *of the ſaid Decoction,* q. ſ. *boil them a little, and make a Cataplaſm.*

This being oftentimes ſhifted, cured the Ulcer; but about three Months after a new Defluction fell upon the Thigh, cauſing a large fiery *Eryſipelas*; now unleſs it were one Purge, and one Decoction of China, Sarſaperil. *&c.* He would take nothing inwardly; thereupon the foreſaid Cataplaſm was laid on which did very well for a time; but then a new Defluxion happening with a large *Eryſipelas*, the Pains encreaſed, the Ulcer enlarg'd it ſelf, and a little after the part gangren'd, and there appeared a blackiſh gangrenous

grenous Particle in the outer ſide of the Thigh, about the bigneſs of a Doller; the Chyrurgeon therefore waſhed the part affected with lukewarm Wine, anoynted it with cleanſing oyntment of Parſley, and laid on the ſame Cataplaſm, which cauſed the gangrenous Particles to fall out; then the Ulcer being well cleanſed, the Cataplaſm alone was laid on; in the mean time for the more convenient Evacuation of the Humors deſcending, I would have made an Iſſue in the outer part of the Calf of the Leg; but the Patient would not permit it. In *March*, the Ulcers being by this time healed, a new ſharp Defluxion fell down with an *Eryſipelas*, which raiſed a new Ulcer as broad as the Palm of a Mans Hand, on both ſides the Thigh; the Cataplaſm would do no good; both ſtrength and Appetite decay'd, and he became ſo weak that he could hardly go, preſently after a Gangrene appearing as broad as a Mans Hand, the Patient ſeemed to be in ſome danger, as well by reaſon of the abundance of ill Humors in his Body, as alſo becauſe of the great loſs of his ſtrength, however the gangrenous Ulcers were anoynted with cleanſing Plaiſter of Parſley, the Cataplaſm laid on; for Spirit of Wine ſo Tormented him that we were forced to leave it off. Then he admitted an Iſſue in the Calf of his Leg, which was made with a potential Cautery; within three or four days the Gangrene was much increaſed in the Ulcer, and ſeized the very place where we had applied the Cautens, from which the Cruſt was not yet fallen off; thereupon the Chyrurgeon Scarified the Cauteriz'd place to the quick, for the more ſpeedy ſeparation of the Cruſt, ſome bits of which he cut off. The three next days the Gangrene encreaſed more and more, ſo that in the place of the Iſſue, there was a piece of dead Fleſh, to be cut out as broad as a Dollar, and as deep as my Thumb; the next day the Gangrenous parts ſtunk like putrified Carrion, and the Gangrene continually encreaſed, therefore to reſiſt Putrefaction and Mortification, we rubbed the part affected with Spirit of Wine, wherein we had firſt diſolved common Salt: and laid on Tents dipt in the ſame Liquor, and bound up the Ulcer three times a day, by which means the ſtench was taken away in half a day. Then that the Gangrenous and dead parts might be the ſooner ſeperated by Suppurating from the parts adjoyning, and the ſound be preſerved from Corruption, we laid on our own Magiſterial Balſom, which powerfully reſiſted Putrefaction, and promoted Suppuration, by which means the Gangrenous parts began to fall away: which being taken off, for ſometime a diſgeſtive Oyntment was laid on, and then the Cataplaſm alone, by which the Ulcers at length were cured, but very ſlowly; and the Humors afterwards vented themſelves out at the Iſſue.

OBSERVATION LXXXIV.

An Exquiſite Tertian Ague.

CAptain *Willmot*, a ſtrong Man, was ſeized with an Exquiſite Tertian Intermitting Fever, after the third Fit he ſent for me; and upon his well day I gave him a Purge that gave him ſix or ſeven Stools, and brought away much Choleric Matter; but his Fit returning the next day, with the ſame violence, he would take no more Phyſic, but by the advice of another Captain, applied the following mixture

to

hotb his Wriſts; which the other Captain told him had expelled Agues in three or four days time, ſo that they never returned.

℞. *White Muſtard prepared with Vinegar,* ʒ j. ſ. *black Peper,* gr. xv. *five Cloves of Garlick, Salt, a ſmall handful, Chimney Soot, Sowre Leaven, an.* ʒiij. *Beat them together and make a Paſt with a little Vinegar of Roſes. Of this apply to each Wriſt, a piece about the biggneſs of a Dollar, and let it lye on three days.*

ANNOTATIONS.

OUR Patient, and many others who ſaw him thus Cured, aſcrib'd the whole Cure to this only Topic: but they were miſtaken; in regard that after the Purgation, the Ague had ceas'd of it ſelf in the ſame Interval of time, without that Topic, or the taking of any other Phyſic; For the Patient obſerv'd an exact Dyet, and the Ague was an exquiſite intermitting Tertian Ague, which as I have obſerv'd, never exceeds above the ſeventh Fit, unleſs any error in Dyet be committed. For Confirmation of which we have that Rule in *Hippocrates, an exquiſite Tertian is judg'd at the end of ſeven Fits at moſt.* I have ſeen a thouſand ſeveral Topics, a thouſand times apply'd to Wriſts, which have avail'd nothing; or if after their application the Agues have either abated, or being Cured, it was not to be aſcrib'd to thoſe Topics but to other Cauſes. I remember I once knew a Perſon that had been long moleſted with a Diuturnal Baſtard Tertian, which when it could not be Cured by all the Remedies preſcrib'd by two Phyſitians, at length by the advice of an Old Woman, he took Ginger, Seed of Naſturtium and Cobwebs kneaded together with a little Populeon-Oyntment, and laid it to his Wriſts. This Topic being twice or thrice ſhifted, the Ague ceas'd within four days, not through the Vertue of the Topic, but becauſe the Topic was applyed at ſuch a time when Nature was endeavouring a Criſis by a Choleric looſneſs and Evacuation of the Belly. Which Criſis happening the next day after the application of the Topic, and laſting two days, freed the Patient from the Ague by Evacuating the Matter which fed the Ague, though the Cure were by the Ignorant aſcrib'd to the application of the Topic. Another I knew, to whom an Egregious Critical Vomiting happen'd preſently after the application of a Topic of the ſame Nature, who was freed from his Ague not by Vertue of the Topic, but by the force of the Vomiting. But theſe follies have invaded ſome Phyſitians to that Degree that they aſcribe great Vertues to theſe Topics which are but meer Whimſeys. Thus many extol Cobwebs, concerning which, ſays *Abraham Seiler, I have obſerv'd, that if before the Fit comes, you apply Cobwebs mixt with Populeon to the Wriſts it has done very much good.* Theſe Cobwebs others mix after this manner.

℞. *The leſſer Nettle, Sage. an.* M. ſ. *Cobwebs* ʒ ſ. *Common Salt.* ʒiij. *Strong Vinegar one ſpoonful. Mix them for an Emplaſter to be applyed to the Wriſts two hours before the Fit comes.*

The *Egyptians* prepare an Oyntment of Spiders themſelves bruis'd together with their Cobwebs, and reduced into the form of a Liniment with Oyl of Roſes: or elſe they boyl Spiders in Oyl of Roſes, and clap them warm to the Wriſts, others prepare this mixture.

℞. *Leaves of Plantain, Celandine the Greater an.* Mj. *Cobwebs, Nettle ſeed, Chimney Soot common Salt an.* ʒj. *Strong Vinegar.* q. ſ. *Make a Cataplaſm, to be applyed to the Wriſts before the Fit, and to be ſhifted three or four times.*

Plater takes the inner Rind of a Nut-Tree, and after he has ſteeped it in ſtrong Vinegar applys it to the Wriſts: at the ſame time he alſo commends this that follows;

℞. *Leaves of Treacle, Muſtard, Plantain, Shepheards-purſe an.* M. ſ. *Apply them bruiſed with Salt and Vinegar.*

Others commend Chimney Soot bruis'd with Naſturtium and the white of an Egg: Others Soot with Garlick and Onions;

Onions; others the freſh Leaves of Crow-foot bruis'd: others Mouſear bruis'd with Salt and Vinegar; and ſome Prick-Madam prepared after the ſame manner. I knew a Woman that applyed to the Wriſts ſeed of Zedoary bruis'd and mix'd with Oyl of Turpentine. *Coetius* applies this following Topic to the Wriſts, which he ſays has cured ſeveral;

℞. *The greater Celandine green, Feverfew an.* M. ſ. *Bruiſe them in a Mortar, and then add Olibanum powdered* ʒ j. *Sowr Leven* ʒiij. *ſtrong Vinegar* q. ſ. *Make ſoft paſt.*

Yet though theſe things are extolled by many, I cannot conceive by what vertue they perform their work, or how they can do any good. Nay the known vertue of the Ingredients are ſufficient to ſhew the Vanity of them. Neither does *Sennertus* ſeem to give any Credit to theſe Topics. *If you aſk*, ſays he, *how theſe Medicaments operate, there can no other reaſon be given then this; that the Putrid Vapours is by theſe Medicaments drawn from the Heart*; eſpecially that defilement which corrupts the Humors, more eſpecially if any ſmall Corruption remain behind, and the Ague be in its declination. Thus becauſe ſome raiſe Bliſters in the Wriſts in the Cure of Agues, therefore all Veſicatories may be ſaid to have an Ague expelling Vertue. But as for Cobwebs, Plantain, Feverfew, Olibanum, Sage, *&c.* There never was nor can be given any reaſon why they ſhould have any ſuch Vertue. *Riverius* however believes that they Communicate their Vertues through ſome remarkable Arteries running to the Wriſt; and by that means may be able to work a Cure. Whereas the Heart expels from it ſelf through the Arteries, ſo that the Vertues of Topics can hardly aſcend through them to the Heart; beſides that, this reaſon does not ſhew us by what Vertue theſe Topics which are ſo well known can any way prevail. So that unleſs *Riverius* will fly to the common Sanctuary of *Occult Quality*, I do not find how he can get out of this Labyrinth: Therefore my advice is that Men abſtain from things venemous and corroſive, and endued with ſuch a Malignity as may do much hurt: but as for other things that do neither good nor harm, let the Phyſitians preſcribe them as they pleaſe, not that any Cure is to be expected from them, but only to ſatisfie their Patients.

OBSERVATION. LXXXV.

A Swelling in the Face cauſed by a Fall.

Mary de Friſt, a Young Maid, the Wagon where ſhe ſate being overthrown, fell with a Terrible Fall upon the left ſide of her Face, preſently ſhe vomited extreamly, and lay in a Swoon for half an hour; when ſhe came to her ſelf ſhe vomited Blood, but that ſeemed to have fallen down into her Stomach from ſome Vein broken in her Noſtrils; half her Head ſwelled extreamly; ſo that her Eyes were hardly to be ſeen; In the exteriour part of the Orbit of the Eye, there was a ſmall ſolution of the *Continuum*: and Blood came out from the inner corner of the Eye, ſo ſoon as I ſaw her to diſſipate the Contuſſion and Tumors, I ordered this Fomentation to be apply'd.

℞. *Leaves of Betony, Flowers of Camomil, Melilot, red Roſes, an.* M. S. *Cumin ſeed,* ʒj. *ſhred them and ſow them in a little bag: which muſt be boiled a while in Wine and preſſed, and then laid on warm.*

I did not queſtion much a Fiſſure in the Skull, for that preſently after her vomiting ſhe fell into a Swoon; Blood had come out of her Eye, and becauſe a very great ſwelling accompany'd the Contuſion: therefore after application of the Topic, I took out of her right Arm

Arm half a pint of Blood; about Night ſhe had a ſlight Fever with ſhivering, which upon her taking a Sudorific left her, and returned no more. The next day I ordered her a Purge, that gave her four Stools, two days ſhe continued the foreſaid Fomentation, repeating it twice or thrice a day. The ſixth of *June*, the ſwelling in her Face was very much fallen, ſo that ſhe could open her Eye indifferent well; the Fomentation therefore being continued for two days longer, her Eye, that was over-ſpread with a redneſs and wept much, ſo that ſhe could not ſee out of it, had the following Collyrium laid all over it, between two Linnen-rags, and ſhifted Morning and Evening.

℞. *Whites of two Eggs, beat them with a little Alum till they thicken into the form of a hard Oyntment; in which after you have ſteeped a Flake of Tow, lay it between two Linnen-rags upon the part affected.*

This Collyrium preſently took away the redneſs of the Eye, abated the weeping, and reſtored her ſight; but the ſwelling of the Face being diſſipated, there ſtill remained a deformed redneſs all over her Cheek, which I cured by waſhing her Face three or four times a day with Virgins Milk; nevertheleſs there ſtill remain'd a weeping of the Eye, which was very troubleſome, I ordered a peice of raw Beef, cut from the Muſcles of the Neck, to be laid to the Neck of the Patient, and ſo to be bound on, ſhifting it Morning and Evening; which being done for ſix days, the weeping ceaſed. And thus was this Maid reſtored to her former Health, only that ſhe had a little Scar in the outer corner of the Eye, next her Cheek, in which place, after the Cure, it manifeſtly appeared that the Bone was depreſſed by the fall.

OBSERVATION LXXXVI.

The Kings Evil miraculouſly Cur'd.

SIR *Water Vane*, a Captain of Horſe in our Army in his Youth had been troubled with the Kings-Evil, nor could all the Art of all the Phyſitians, and Chyrurgeons of *England*, of any remark, do him any good: ſo that the Malady ſtill encreaſed, thereupon he was adviſed to go to the King, and to deſire his Bleſſing, from which he could only expect a Cure; this Favour was eaſily obtained by his Father, then Secretary to King *Charles* the Firſt, who moved with Compaſſion laid his hand upon the Head of the Young Lad, and at the ſame time pronounced theſe words. *The King touches thee, but God heales thee*: and withal gave an Angel peice of Gold, boar'd through, and threaded with a blew Riband, to hang about his Neck, which afterwards he always wore as long as he lived. And from that time his Diſtemper vaniſhed in a few Months, without the help of any Phyſic; I asked him ſeveral times, whether he durſt not leave off that peice of Money, for ſometime; to which he anſwered, that he durſt not, for that he had known ſome who having thrown away their Money, were again perſecuted with the ſame Diſtemper, and though touched a ſecond time by the King, could never be cured.

ANNOTATIONS.

THis Privilege of Healing the *Evil* many aſcribe to the Kings of *France* only; and among the reſt *Andrew Laurentius*. But Experience ſhews us that this Divine Privilege is granted by God, not only to the Kings of *France*, but alſo to the Kings of *England*. For beſides this Sir *Walter Vane*, I knew another Young Gentleman the Son of *C. Killegrew*, who having receiv'd the ſame Kings Bleſſing, was Cured of the Evil otherwiſe incurable, who alſo wore ſuch another peice of Gold about his Neck as Captain *Vane* did.

OBSERVATION LXXXVII.

Obſtruction of the Spleen.

CAptain *Auſſuma*, in the full Vigour of his Age, had long been troubled with an Obſtruction of his Spleen, and was become very Melancholy. At length his Spleen grew hard and ſwelled very much, ſo that it bunched out a good way; ſo ſoon as he came to me, after he had try'd ſeveral others in vain, I preſcribed him a proper Diet, forbidding him ſmoak'd and Salt Meats, windy Fruit, ſhell Fiſh, Herrings, Salmon, in a word all ſorts of Meat, breeding crude and flatulent Humors, all ſtrong and ſweet Wines, all muddy ſorts of Ale: but to obſerve a moderate Diet upon food of eaſie digeſtion and good nouriſhment; and for his drink enjoyn'd him ſmall Wine and ſmall Ale, and moreover to keep merry Company and refrain Melancholy; this done I gave him a convenient Purge; but becauſe he had an Antipathy againſt Phyſic, I ordered him only to take a draught Morning and Evening of this Medicinal Wine.

℞. *Rind of the Root of Tamariſch, Capers, Fennel, Elecampane, Polypody of the Oak, an.* ℥ ſ. *Water-Trefoile,* Mj. *Dodder, Ceterach, Fumitory, Leſſer Centuary, Roman Wormwood, an.* M. ſ. *Nutmegs, Juniper-berries, Seeds of Fennel, Biſhops-weed and Aniſe, an.* ʒj. *Make a little bag to ſteep in* ℔. v. *of White-Wine.*

This being drank up, the ſame was repated again with an addition of Senna leaves, ʒj. ſ. Aniſeed, ℥ ſ. of which he drank a draught every Morning that gave him five Stools; this gave him ſome eaſe, brought him to a Stomach, and made him a little more chearful; but the hardneſs of his Spleen with the Pain remain'd as it was before; but in regard, the Patient would take no Decoctions, Powders, Conditements, or other Medicaments, nor would take the Wine preſcribed him any longer, I preſcribed him the following Topics,

℞. *Wormwood, Althea, Mallows, Flowers of Camomil, Melilot, Elder Dill, an.* Mj. *Seeds of Cummin,* ℥ ſ. *of Aniſe, Lovage, Fennel, an.* ʒij. *Make two little quilts, according to Art.*

℞. *Roots of Dwarf Elder* ʒj. *Althea, Bryony, Fennel an.* ℥ ſ. *Flowers of Elder, Coleworts, Hemlock, an.* M. j. ſ. *Mallows, Beets, Althea, Flowers of Melilot Camomil, an.* Mj. *Cummin-Seed, Aniſe,* ʒvj. *Boyl them in common water,* q. ſ. *to* ℔ij. ſ. *then add ſtrong Vinegar* ℔ ſ.

℞. *Oyl*

℞. *Oyl of Capers, Wormwood, bitter Almonds, Gooſe-greaſe, an.* ℥j. *Oyl of Turpentine,* ℥ ſ. *Mix them for a Liniment.*

In the Morning he made uſe of theſe Topics in this manner, firſt the Region of the Spleen was chafed ſomewhat hard, the two little bags were dipped in the Decoction being warmed by turns, and the Fomentation continued for half an hour: afterwards the place affected was anointed with the warm Oyls, which being contiued for ſome days and the Patient now and then taking a draught of the laſt Wine, the ſwelling in his Spleen quite vaniſhed, and the hardneſs went off; and to diſſipate the Relics, all other Topics being laid aſide, this only Emplaſter was applied.

℞. *Galbanum diſſolved in Vinegar,* ℥vj. *Ammoniac,* ℥iij. *Emplaſter of Melilot,* ℥ ſ. *Mix them, and ſpread them upon Leather.*

Thus the Captain being freed from his Diſtemper, returned to the Camp.

ANNOTATIONS.

OBſtructions and hardneſs of the Spleen, where the Patients refuſe to take inward Medicines, are many times remarkably Cured by Topics. Among which Galbanum, and Ammoniac diſſolv'd in Vinegar are cheifly to be commended; *Fabricius ab Aquapendente* applauds his own Cere-cloth, made of two parts of Ammoniac diſſolv'd in Vinegar, one part of juice of Tobacco, half a part of Pine Roſin, Turpentine and Juice of Dwarf-Elder, the other of Oyl of Capers and new Wax, *q. ſ.* with which Degeſtive and Emollient Plaiſter he Cured ſeveral hard Spleens. *Mercurialis* applauds this that follows,

℞. *G. Ammoniac diſſolv'd in Vinegar,* ℥j. *Powder of both Hellebores, Colocynth an.* ℥j. *Mix and apply them.*

Heurnius compounds a moſt effectual Plaiſter thus,

℞. *Hemloch,* M. iiij. *Ammoniac.* ℔j.

Infuſe them in very ſharp Vinegar eight days; then let them boyl till the Ammoniac be diſſolved. Then ſtrain them hard through a ſtrong Linnen Cloth; and let the ſtrain'd Liquor ſimper five times, then with the Wax and Oyl of Sweet Almonds make an Emplaſter. *Foreſtus* makes uſe of the following Oyntment.

℞. *Oyl of Capers, White Lillies, New Butter an.* ℥ſ. *Juice of Briony, and Sowbread an.* ℥v. *Boyl them to the Conſumption of the Juices, then add Ammoniac diſſolv'd in Vinegar,* ℥ij. ſ. *Hens greaſe, Marrow of Calves Legs, Moiſt Sheeps-greaſe an.* ℥ſ. *Powder of the Rind of the Roots of Capers, Tamariſh, Ferne, Ceterach an.* ℥ſ. *Seed of Broom, Agnus Caſtus an.* ℈ſ. *A little Wax. For an Oyntment.*

Amatus of *Portugal* extols this for a Miracle, as that with which he has cured the moſt obſtinate *Schyrruſes* of the Spleen,

℞. *Common Oyl,* ℔ iij. *Marrow of Oxes Leg,* ℔ j. *New Butter,* ℔ ſ. *Juice of Briony, Sowbread an.* ℔ j. *Let them boyl over a gentle fire to the conſumption of the Juices. To the ſtraining add Green Wax,* ℥ viij. *Powder of Ceterach, Rind of Caper-roots, Tamariſh, and Agnus Caſti-ſeed an.* ℥ iij. *Mix them for an Oyntment.*

Senertus prepares a Sovereign Remedy of the juice of the Flowers of Elder mixt with a Decoction of Mallows and Oxycrate. *Galen* commends ſimple Vinegar, becauſe it cuts and attenuares thick obſtructing Humors, and is proper in reſpect of the Bowel, becauſe Fermentation is not troubleſom to it. *Aquapendens*

pendens his having cured the *Schyrrus* of the Spleen and Dropſie, by fomenting the Abdomen with a Spunge dipt in Lime-water. But as for cutting the Spleen as it is called, he laughs at it as a ridiculous peice of Witchcraft; *This is done,* ſays he, *by ſetting the Edge of an Ax upon the hard Spleen, the place being firſt covered with a piece of Paper, and then ſtriking upon the Ax with a Hammer or Mallet. One of theſe Profeſſors once brought his Ax to one that was troubled with a hard Spleen; but after he had ſet his Ax upon the Paper, he ſtroke ſo hard with his Mallet, that he cut through Paper and Skin, into the very Spleen it ſelf, to the loſs of his Patients Life.*

OBSERVATION LXXXVIII.

The Sciatica.

THE Son of *Albert Verſtegen*, about twenty four Years of Age, addicted neither to Venery nor Gluttony, began to complain of Sciatic Pains in his right ſide; which increaſed in a few days to that degree, that he could no longer go, when I was ſent for I found no Tumour in the Part, nor Inflammation, but a ſharp Pain with a weakneſs in the Joynt, ſo that he could not move his Thigh but with great trouble; he had taken by the advice of others two Purges; and therefore I rather choſe that I might abate the Defluxion of the Humors to preſcribe the following Apozem, of which he was to drink three or four Ounces in a Morning, which gave him three or four Stools.

℞. *Roots of Elecampane, Valerian, Fennel, Bryony, Mechoacan, Stone Parſley, an.* ℥ ſ. *Herbs, Roſemary Majoram, Betony, an.* Mj. *Thyme, Baume, Sage, Germander, Ground-Ivy, Flowers of Elder, an.* M. ſ. *of Stœchas, two little handfuls, ſeeds of Lovage and Aniſe, an.* ℥ij. *of Carthamum,* ℥j. *Raiſins of the Sun well waſhed,* ℥ ij. *Boyl theſe in Common-water,* q. ſ. *adding at the end Leaves of Senna cleanſed,* ℥j. ſ. *white Agaric,* ℥ij. *Fennel-ſeed and Dill-ſeed, an.* ℥j. ſ. *Make an Apozem of* ℔ij.

The following Emplaſter was likewiſe applied to the part affected.

℞. *Sulphur finely Powdered,* ℥v. *Caſtoreum,* ℥j. *Tar.* ℥vj. *Oxycroceum Plaiſter,* ℥ſ. *Balſome of Sulphur* ℥ij. *For a Plaiſter to be ſpread upon red Leather.*

After he had taken all his Apozem, and that his pains remain'd in the ſame condition, I preſcribed him another purging Decoction; of which he drank twice a day.

℞. *Saſſafras wood,* ℥vj. *Roots of Eringos, Cammoch, Lovage, an.* ℥j. *Maſterwort, Fennel, ſtone Parſley, an.* ℥ ſ. *Vervaine, Roſemary, Betony, Majoram, Germander, Ground-Ivy, an.* Mj. *Savine, Flowers of Stœchados, an.* M. ſ. *Aniſe-ſeed. Juniper-berries,* ℥iij. *Boyl them in Common-water,* q. ſ. *to* ℔. ij. *Then add Syrup of Stœchas,* ℥iij. *For an Apozem.*

Two days after the former Plaiſter was laid on again, and when he had drank up his Apozem, I gave him the following Vomit, which brought up a great quantity of Viſcous Flegm with Choler.

℞. *Leaves*

℞. *Leaves of green Aſſarabacca*, ℥iij. *Bruiſe them and preſs out the juice with* ℥ij. *of the Decoction of Raddiſh, to which add Oxymel Scyllit, with Agaric*, ℥j. *Mix them for a Potion.*

When all theſe things did no good I applied this other Plaiſter.

℞. *White Muſtard-ſeed, and of Naſturtium, an.* ℥j. *Caſtorium* ℈ij. *Euphorbium* ℈j. ſ. *Spaniſh-Sope*, ℥x. *Pine-Roſin, and Turpentine, an.* ℥iij. *Mix them well to ſpread upon Leather.*

After this had ſtuck on two days, it had raiſed innumerable little Bliſters in the Skin, out of which a green Humour flowed from the inner parts in great quantity; ſo that in four days he felt great eaſe. The Plaiſter being removed I laid on Colewort-leaves; but obſerving the Plaiſter not to be very violent, but that it only gently drew out the internal Humors, and kept the Bliſters open without Corroſion, I laid it on again; and ſo in twelve days the pain went quite off, and the joynt was ſo corroborated, that the Patient went about without any trouble; but for fear of a relapſe I gave him the purging Apozem again, and the Plaiſter of Sulphur was laid on for a Fortnight longer, which abſolutely compleated the Cure.

ANNOTATIONS.

THough the Sciatica be a kind of a Gout, yet becauſe of the Place the Cure differs in ſome Remedies. Sometimes it is very hard to be cured, becauſe that joynt is not ſo profound, that Topics cannot reach it by reaſon of the thickneſs of the Muſcles that lye over it: and for that inward Medicines require a great deal of time to abate and remove the Cauſe. This Diſeaſe proceeds from too much fullneſs of Blood, ſometimes from a defluxion of cold and and ſharp Humors. In repletion Blood-letting is requiſite; which in a very great repletion is to be done in the Arm, then in the Thigh affected. The Vein is to be opened in the Ham, or elſe the Sciatica Vein, I have cured, ſaid *Galen*, the Sciatica by opening a Vein in the Thigh. Some there are that apply Leeches to the Fundament inſtead of Blood-letting. Which way *Paulus* and *Aurelian* commend, if you lay on eight or ten Leeches at a time; and *Zacutus* affirms, he has cured the Sciatica with Leeches, when other Remedies failed, within the ſpace of ten hours. Some prefer Cupping-glaſſes before Leeches. But if the Malady proceed from ſharp, tartarous and cold Humors, Blood-letting does no good (unleſs there be a Plethory) but firſt there muſt be ſtrong Purging with *Elect. Caryocoſtin.* and *Hermodactyl Pills*; or Vomits of *Ammonia*, or *Aſarabacca*; and then Topics ſuch as aſſwage Pains, ſufficiently known to every skilful Phyſitian. Some extract and diſſipate the Morbific matter inſenſibly: to which purpoſe *Donatus ab Altomary*, takes a great quantity of the Stones of ſweet Grapes, and preſſes out the Liquor ſtrongly. This he heats with its Muſt, then pours it out upon the Pavement, and with his Hands ſtrongly compreſſes into a heap; then making a kind of a furrow in the Grape-ſtones, burys the Patient in them, up to the Mid-belly; and there lets the Patient lye to ſweat for half an hour, or an hour twice a day. *Duretus* commends Grape ſtones in all ſorts of Gouts. *If in Vintage time the Grapes are carried into a Barn, and covered with Coverlets till they grow warm, and then for the Patient to thruſt his Feet, Arms, Legs, or elſe to lay his whole Body in the heap.* Then which ſays he, *There is not a better Remedy under Heaven. Solenander* alſo among the beſt and ſafeſt Remedies that corroborate the Parts affected, and cheriſh the natural heat, commends the laying the Hands and Feet, or other Parts affected, in a heap of Grape-ſtones hot from the Preſs, or heated with new Wine, and this continued for fifteen days. To which he adds that he knew a Noble Perſon, that could not go, who was recovered by the uſe of this Medicine. I knew my ſelf, a Country man cured by ſuch a Fomentation,

for

for ſome days together in Horſe-dung. *Matthiolus* affirms experimentally, that ſeveral Sciaticas have been cured with the ſlimy water of Snails, when all other Remedies failed, which *Parœus* and *Laurentius* approve. Old ſtinking Cheeſe kneaded into the form of a Cataplaſm, with the Decoction of a Weſtphalia-Ham, aſſwages the Pain, draws forth the cauſe of the Malady, and diſſolves the rigid hardneſs of the Part. *Sylvius* commends a Cataplaſm of Dwarf-Elder, Barley-meal and Honey. *Foreſtus* alſo tells of two Sciaticas cured, with laying upon the Part only Nettles boyled in Ale. We look upon Balſom of Sulphur among the moſt effectual Remedies; as having more then once obſerved the happy effects of it. *Galen* commends an Emplaiſter of Pitch two Parts, and one of Sulphur, mixt and laid upon the Part affected, till it fall off of it ſelf: Which *Foreſtus* ſo highly extols as the moſt effectual Remedy that can be invented; only he believes it would be better to equal the proportions of the Pitch and Sulphur.

If theſe things, or the like, avail not, then ſuch things muſt be made uſe of that inſenſibly draw forth the matter, and that either by diverſion or from the Part affected. By diverſion, Cauteries applied to the Arms and Thighs are of great uſe. So *Paſchal* tells us of a Phyſitian cured of a pain in his Hipps, by a Cauſtic applied under his Knee, of Quick-Lime and Alum. *Hippocrates* orders an Inciſion of the Veins behind the Ears. *Zacutus* of *Portugal* in a defluxion from the Head, ſaw a Perſon cured by a Cauſtic applied behind the Ears, from whence after the falling off of the Cruſt, for ten days together, there flowed a thin and watery moiſture, and ſo the Diſtemper ceaſed.

From the Part affected Viſicatories and Rubificants draw forth the peccant Matter. Thus *Douynetus* tells us of ſeveral that have been cured by the application of Veſicatories. *Arculanus* and others have ſucceſsfully made uſe of a bliſtring Cataplaſm in an obſtinate pain that gave way to no other Remedies.

℞. *Sowre Leven* ℔ ſ. *Cantharides* ʒ j. *Pulp of Figs* ʒ ſ.

Andrew Laurentius recomends this Viſicatory.

℞. *Old Leven* ʒ ij. *Cantharides* ʒ. ij. *Seed of Muſtard and Staveſacre, an* ʒ iij. *Beat them together with Strong Vinegar, for a Veſicatory.*

John Matthew de Gradibus prepares another of the Seeds of Muſtard and Naſturtium, Pigeons-dung, Decoction of Figs and Venegar; which rubifies and raiſes Bliſters, which being broken and cleanſed with the Decoction of Figs, then lay on a Colewort Leaf warm; and this he ſays extirpates the inveterate Pains of the Hips and the Gout. *Galen*, *Aetius*, and *Paulus* preſer a Cataplaſm of wild Creſſes, which raiſes Bliſters; and is accounted a peculiar Remedy for theſe Diſtempers. *Schenkeus* tells us of a Sciatic, who when all other Remedies failed, of his own Head took Skins of Hemp macerated with Aſhes, and having boiled them in ſtrong Vinegar, laid them to the place affected, as hot as he could endure them: This raiſed ſeveral Bliſters upon the Skin, out of which flowed a great quantity of greeniſh yellow Water, by which means his Pain left him. *Tagaultius* celebrates this Emplaiſter of *Galen* and *Avicen*, then which he ſays there can be none more effectual, or that gives ſuch preſent eaſe.

℞. *Muſtard and Nettle-ſeeds, Sulphur, Froth of the Sea, round Birthwort Bdelium an.* ʒ j. *old Oyl, Wax an.* ʒij. *For an Emplaiſter.*

I have found that Emplaiſter, which I preſcribed to our Patient, with Spainiſh Soap, to have wrought wonderful effects. I remember a Young Maid at *Montfort*, miſerably troubled with the Gout, ſo that ſhe could neither move Shoulders, Arms, nor Hips, who was cured only with Emplaiſters of Spaniſh Soap, mollified in Wine, and ſpread upon Leather; which raiſed Bliſters, and drew out a great quantity of yellow, greeniſh Water; which reſtored her unexpectedly to her Health in a few weeks.

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OBSERVATION LXXXIX.

A Wound with a Bullet.

A Citizen of *Nimeghen*, the twentieth of *May*, 1637. imprudently diſcharged his Piſtol downward; ſo that the Bullet rebounding from the Flint-ſtone-pavement of the Street, hurt a Woman that was paſſing accidentally by. The Bullet had entered the Cavity of her Breaſt about three Fingers from the Spine of the Back, between the fifth and ſixth Rib, and entring the exteriour ſubſtance of the Lungs, had made a great Wound in the fourth Rib, in the ſide from the inner part, ſo that the Rib was broken, but the Bullet did not paſs through, but ſtook in the Cavity of the Breaſt, not round but flat and oblong by hitting againſt the ſtone, as appeared by the Wound unequal and bigger then uſual, the Woman was carried wounded home; very little Blood Iſſued from the Wound; but the next day with Coughing ſhe threw up a good quantity, the danger was great which I foreſaw; in regard that the Bullet lying upon the Diaphragma, could no way be drawn forth out of the Cavity of the Breaſt: as alſo for that Wounds in the Lungs are difficultly cured, becauſe of their continual motion; eſpecially when the Wound is made by a Bullet, which cannot be done without a great contuſion. However the Chyrurgeon bound up the Wound, and after I had gently purged her Body, I preſcribed her this Apozem to drink Morning and Evening.

℞. *Roots of Madder*, ℥j. *Eryngos*, *Fennel*, *ſtone Parſley*, *an.* ℥ ſ. *ſcraped Licorice*, ℥vj. *Herbs*, *Scabious*, *Violet-leaves*, *Coltsfoot*, *Chervil*, *Leaves of black Ribes*, *or Garden Currants*, *an.* M. j. *greater Celandine*, M. ij. *four greater Cold-ſeeds*, *Aniſe-ſeed*, *an.* ℥j. *Raiſins of the Sun*, ℥ij. *Boyl them in Common-water*, q. ſ. *to* ℔ij. *add Syrup of Licorice*, *Poppy Rheas*, *an.* ℥j. ſ. *Mix them for an Apozem.*

She complained of no pain but one where the Wound was, and the place where her Rib was broken, which pain went off upon laying on a Plaiſter of Oxycroceum, and her Rib cloſed again. The firſt ſix days ſhe was very weak, ſhe eat little or nothing: little or no Matter came out of her Wound: ſhe had no Fever or Cough or difficulty of Breathing; and after the ſecond day ſhe ſpit forth nothing either of Blood or Matter out at her Mouth. *May* twenty ſeventh, being ſomewhat bound, we gave her a looſening Draught, which gave her two or three Stools. *May* the thirtieth ſhe was grevouſly tormented, ſo that every Body thought ſhe would have died; but in the Evening of a ſuddain ſhe coughed up a good quantity of white Matter with ſome Blood, which gave her great eaſe, and then ſhe began to be better, the Wound alſo cloſed againſt our Wills; neither did any thing of Matter come forth from the Wound out of the hollowneſs of her Breaſt all the time of the Cure; after ſhe had voided this corruption, for ſeven days ſhe continued without a Cough. The ſeventh of *June*, with a ſlight Cough ſhe ſpit up a ſmall quantity of Corruption again, and then the Cough ceaſed, and the Patient grew ſtronger and ſtronger every day, nor did ſhe after that ſpit forth any more Matter or Blood, but after the ſecond Month being reſtored to her perfect Health, went abroad again, feeling no Inconvenience from

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ſo great a Wound afterwards for nine Years together, nor did ſhe feel the Leaden Bullet in her Breaſt, only when ſhe fetched her breath with a deep ſigh, ſhe felt ſomething heavy upon her Midrife.

ANNOTATIONS.

WIthout doubt the Bullet did not paſs the middle of the Lungs: nor touched the *Bronchia* or bigger Veſſels, but only ſlightly touched the ſubſtance of the Lungs in the outer ſide: otherwiſe more terrible Symptoms would have enſued; nor would the Cure have been ſo ſoon accnmpliſhed; which however was ſufficiently to be admired, when ſuch a wound could not happen without a very great Contuſion.

Now the great Wounds in the Lungs are incurable, and ſlight Wounds difficult to be cured, yet we are not to deſpair, ſince very great Wounds in the Lungs have been often Cured. I remember I knew a Victualer that lived near *Leyden*, who in a ſcuffle with a Country-man was ſtabbed under the Pap of his right Breaſt, with a broad Knife that paſt through the middle of his Lungs, and went out behind under the *Scapula*. Yet this Man reduced to meer Skin and Bones, through the Exulceration of his Lungs, two years afterwards being brought to *Utrecht*, was perfectly cured by a Chyrurgeon, with only vulnerary Decoctions. However a great Part of his Lungs was conſumed by Suppuration, which was eaſily perceived, when he moved backward or forward, for then his right Lung would ſtrike againſt his Breaſt, like the Clapper of a Bell. 'Twas to be admired that ſuch a Wound ſhould be brought to a perfect Cicatrization; yet this Man I ſaw ten years after without a Cough, without any Malady, ſound and whole as ever I ſaw a Man in my Life. In the year 1635. I had another ſturdy Country-man in Cure, who had received a Wound under the Pap of his left Breaſt, with a broad Knife that entered as far as the middle of the Lungs. Other Countrymen before we came had laid him upon his Belly, and kept the Wound open with their Hands; ſo that he had bled three full Chamber-pots. After we had bound up the Wound, the Patient ſounded and it was thought he would have died, but upon giving him corroborating Cordials he came to himſelf. For the firſt day he voided ſometimes a great deal of Blood, and ſometimes Corruption; and frothy coagulated Blood came forth from the Wound, but not much; yet to be ſhort, this Man was cured of this dangerous Wound by the Uſe of proper Medicaments, nor did he afterwards feel any inconvenience in his Cheſt.

Hildan tells us alſo of a remarkable Cure of the Lungs wounded, at what time a good Part of the Lungs was cut away. And many other Examples of the Lungs cured are frequently to be found in ſeveral other Authors.

OBSERVATION XC.

An Extraordinary Binding of the Belly.

Nab Offendorph, a *German* Gentleman, a ſtrong Man in the Flower of his Age, was uſually ſo bound in his Body, that he could hardly go to the Stool without the help of Phyſic; yet he was not ſick, but when he had not gone to Stool in five or ſix days he grew ſleepy, dull and lazy. In *Auguſt*, not having been at Stool for ſeven days together, when his uſual Pills would not move him, he went to *Monſieur Romphius*, Phyſitian to the Queen of *Bohemia*, who gave him two Gliſters and two Purges without ſucceſs; then afraid of his Life he came to me: at what time he had been bound for ſixteen Days together, firſt therefore I try'd to move him with this following Gliſter.

R. *Roots*

℞. *Roots of Bryony* ℥j. *Herbs, Mallows, Althea, Herb Mercury, Wormwood, Leſſer Century, Flowers of Cammil. and Melilot, an.* M j. *Leaves of Senna* ℥j. ſ. *Colocynth Apples* ℥j. *fat Figs n°.* vij. *Aniſe-ſeed* ℥ ſ. *Boyl them in Common-water,* q. ſ. *to* ℥x. *add to the Straining Stibiate-Wine,* ℥iiij. *For a Gliſter.*

After he had kept this a quarter of an hour, his Belly was much moved, and he had above twenty Stools with a great deal of eaſe, afterwards I preſcribed him a looſning and emollient Diet, and ſo ſent him away back to the Camp quite eaſed of his burthen.

ANNOTATIONS.

Schenkius has collected ſeveral Examples of People that have been ſtrangely bound in their Bellys. In which Caſes, when Cathartics will do no good: I have obſerved the wonderfull Operations of Stibiate-Wine: I remember I gave a Purge to a ſtrong luſty Country-man once, that was very much bound in his Body, but without ſucceſs. The next day therefore I gave him a Gliſter, wherein among other things I boiled ℥ ſ. of dry Tobacco, which preſently opened his Body with a Witneſs. I knew a Captain of a Man of War alſo, that told me, how he was bound in his Body at Sea, to that degree, that when no Medicaments would move him, and that he was in diſpair of his Life, by the advice of one of his Seamen, drank the Parings of his Thumb-Nails in a draught of Ale; which when he had done, at firſt he fell into a Swoon, ſo that every body thought he would have dy'd; but coming to himſelf, he purged upward and downward to that degree, that he was ſoon freed from his Diſtemper.

OBSERVATION XCI.

A Baſtard Ague.

A Daughter of *Captain Rifflaer*, about ſix Years of Age, had been troubled a long time, with a diſorderly kind of Ague, yet not very vehement, which took her ſometimes in the Forenoon, ſometimes after Dinner, ſometimes at Night, ſometimes every day, ſometimes every other day; ſhe looked black and blew about the Eyes; ſlept unquietly, had her Belly ſwelled and diſtended; rubbed her Noſe often but complained of no pain, from theſe ſigns I conjectured that crude and Flegmatic Humors were putrified in the lower Region of her Belly, which cauſed the Ague, and that moreover ſhe might have Worms in her Belly; now in regard ſhe was very ſqueamiſh and would take nothing that was bitter, I gave her ℈j. of *Mercurius Dulcis* which gave her five or ſix Stools, that brought away much viſcous and ſlimy Matter, and three or four large Worms; the three days following I ordered her to take a doſe of the following Powder, Morning and Evening, in which time ſhe voided eight Worms.

℞. *Harts-horn, burnt Coral prepared, an.* ℈iiij. *Sugar-candy* ℥ij. *to be divided into ſix equal Doſes.*

Afterwards when I obſerved her Ague, and the diſtenſion of her Belly to continue in the ſame condition, I gave her again ℈j. of *Mercurius Ducis*, which after it had given her ſix Stools, ſhe found her ſelf better, the next three days ſhe would take nothing; the fourth day I got

her to take *Mercurius Dulcis* again, which after ſhe had voided much viſcous and watry Matter, but without Worms, the diſtenſion and tumour of her Belly went off together with her Ague, and ſhe recovered her former Health.

ANNOTATIONS.

IN theſe Caſes I have frequently with ſucceſs made uſe of *Mercurius Dulcis:* and though ſeveral eminent Phyſitians diſapprove the uſe of it, as too dangerous, yet ſo it be well prepared, I never obſerved that it did any harm in moiſt Bodies. For dry Conſtitutions it is not thought ſo proper, and therefore to ſuch I either give other Phyſic, or mix other Purgatives with it, that it may be the ſooner expelled out of the Body. Thus *Simeon Jacoz*, gave xii. gr. of it mixed with gr.v. of Diagridion to a Child of four Years of Age, which within two hours brought away twenty Worms. And indeed it is a moſt excellent Remedy againſt Worms in the Belly; for it not only kills and expels the Worms, but brings away the the cauſe that breeds them; therefore ſays *Sebaſtian Strommayien, there is no ſuch Remedy to be found; for it falls upon all manner of Worms bred in our Bodies, ſpeedily, ſafely and pleaſantly, and by a certain Specific quality utterly expels them: which Experience has ſufficiently made manifeſt.* Sometimes inſtead thereof ℈ j. of Jalap pulverized; or leſs according to the Age of the Patient, which is an inſipid Medicine and and not diſpleaſing to the Taſte, which gently Purges away the Cauſe of Worms and Agues joyned together. *Rondeletius* extols Electuary *Diacarthamum*, as a powerful Remedy to expel Worms and Purge away Flegm, and the corrupt Chylus that breeds and nouriſhes Worms. Others commend Diaturbith with Rhubarb. For ſuch as can take ill taſted Phyſic *Hiera Picra*, or Aloes alone is an excellent Remedy, given in Pills. *Dodoneus* tells us of a Woman of forty Years of Age ſuddenly taken with terrible gripings in her Stomach, that upon taking *Hiera Picra* voided forty Worms; and the ſame Vertue have all Medicaments, wherewith Aloes is mixed. *Benivenius* writes of one that after he had taken a Compoſition of Aloes, Myrrh and Saffron, voided forty eight Worms. *Crato* recommends theſe Pills that follow.

℞. *Aloes Roſat.* ʒ j. *choice Mirrh.* ʒ j. *Make them into Pills, the Doſe* ʒ ſ.

Plater commends theſe,

℞. *Aloes*, ʒij. *Myrrh*, ʒj. *Worm-ſeed* ℈j. *Make them into a Maſs with juice of Wormwood or Gentian, the doſe from*, ʒſ. *to* ʒj.

Sennertus preſcribes theſe,

℞. *Aloes*, ℈j. *Rhubarb.* ℈ij. *Myrrh*, ℈ ſ. *Trochiſchs of Alhandal*, gr. iij. *Powder of Coral*, ʒ ſ. *Make them into twenty two Pills with juice of Wormwood. The Doſe for Children* ℈j.

To deſtroy all Matter and Nutriment of VVorms in the Guts there is not any better Remedy to be found, then for the Patient to ſwallow once a VVeek one ℈. *of Aloes Succotrine; for Aloes has a peculiar occult quality to Purge and cleanſe the extream Parts of the Guts.* This is the opinion of *Mercurialis* in his own Words; but I uſually order a ʒ or two of Rhubarb to be put into a little bag, and hung up in the ordinary drink which the Patient drinks; and by that means I both expel the Worms and the cauſe of the Worms.

Saxonia and *Solenander* with many others extol the Decoction of Sebeſten, in ʒiiij: of which *Crato* macerates, ʒj. of Rhubarb and gives the ſtraining to drink; Rhubarb alſo given in ſubſtance is a great enemy to the Worms; and *Dodoneus* voids them with this Powder.

℞ *Worm-ſeed* ʒj. *Shavings of Hearts-horn, Citron-ſeed, and Sorrel-ſeed, an.* ℈j. *Rhubarb*, ʒij. *Make them into a Powder, the Doſe*, ʒ j.

Riverius takes,

℞. *Powder of Rhubarb, and Coral, an.* ʒ ſ.

Duretus preſcribed this,

℞. *Choſen Rhubarb, Wormwood, Sea Wormwood, Shavings of Harts-horn, an.* ʒiij. *Make them into a Powder Doſe* ʒj. *with the Decoction of Scordium.*

This as we have tried, ſays he, excells all the reſt. Laſtly *Antonius Cermiſonius* as a moſt deſtroying expelling Remedy againſt the Worms, preſcribes a Gliſter of ʒ x. of Goats Milk, and ʒij. of Honey.

OBSERVATION XCII.

The Worms.

THE Son of Mr. *Cooper*, about ſix or ſeven years old, had been long troubled with Worms in his Belly, which ſometimes aſcending his Gullet, crept out at his Mouth in the Night-time. The Parents had often given him Worm-ſeed, but to no purpoſe; ſo that at length, when the Child was nothing but Skin and Bone, they ſent for me. I found him thirſty and averſe to all manner of Phyſick; thereupon I took half a pound of Quick-ſilver, and macerated it in two pound of Graſs-water, ſhaking the Water very often. Afterwards, having ſeparated the Mercury, I added to the Water, Syrup of Limons ℥iij. Oyl of Vitriol, q. ſ. to give it a grateful Taſte. This he only took for two days together, in which time he voided downward ſix and thirty Worms and being ſo rid of his troubleſome Gueſts, recovered his Health.

ANNOTATIONS.

SOme extol Quick-ſilver it ſelf given in the Subſtance, as an excellent Remedy againſt the Worms; inſomuch that *Sanctorius* ſays, there is no killing of the Worms but with ſtrong and violent Medicines, as Aloes and Mercury or Quick-ſilver. Of which, *Baricellus* thus writes, *Quick-ſilver*, ſays he, *which many take to be Poyſon, is given with great Succeſs againſt the Worms, and is accounted ſo certain a Remedy in* Spain, *that the Women give it to Infants that puke up their Milk, to the quantity of three Granes. I cured a VVoman that for nine days together had been troubled with continual Vomiting, occaſioned by the VVorms; beſides that, ſhe had not eaten in three days, nor could keep what ſhe ſwallowed; but after I had given her two Drams of Quick-ſilver, mortified with a little Syrup of Quinces, without any trouble, ſhe voided downward about a hundred VVorms, and was freed from her Diſtemper the ſame day. I have VVater at home wherein I continually keep Quick-ſilver infuſed, and willingly give it away to children for the VVorms, yet never heard of any Hurt that ever it did.* The doſe of Mercury to be given to Children is ℈j. to elder People ℈ij. or ʒj. It is corrected and mortified by bruiſing it in a Glaſs Mortar with brown Sugar, till it be diſſolved into inviſible Parts; and to prevent it from returning to its priſtine Form, you muſt add to it two little Drops of Oyl of Sweet Almonds, and give it faſting with Sugar of Roſes, Syrup of Violets or Quinces to the Party affected. *Zappara* confirms this uſe of Quick-ſilver by many examples; and *Hildan* tells of a Woman cured of the Worms by Quick-ſilver, of which ſhe paſſed ʒj. ſ. through a piece of Leather, and then ſwallowed it. Where this is remarkable, that the ſame Woman at that time wore a Plaiſter upon her Navel, which was afterwards found all covered over with Quick-ſilver. Thus many Phyſicians celebrate Quick-ſilver; but more applaud it than condemn it; as *Plater*, *Horatius*, *Eugenius*; and *Fallopius*, ſays of it, *That it does not work thoſe Effects being drank, as uſed by way of Ointment. I have known*, ſays he, *Women that have drank Pounds of it to cauſe Abortion without any dammage; and I have given it to Children for the Worms.* The ſame is teſtified by *Marianus Sanctus*, and *Fracaſtorius*. And *Matthiolus* affirms, that Quick-ſilver is only prejudicial, becauſe it tears the Guts by its weight; *and therefore if it be not given in too great a quantity, he ſays it can do no harm.* And I have ſeen it given by Midwives to Women in difficult Labours, without any hurt at all. For my part, I never give it alone, but always in ſome Infuſion of Graſs-water, Wine, or other Liquor. And as for *Stromaiier* and *Horſtius*, though they reject raw Quick-ſilver, yet rightly prepared, they extol it as the beſt Remedy in the World againſt the Worms. *Sennertus* however adviſes, that though Quick-ſilver may be uſed

in deſperate Caſes, yet to forbear it where milder Medicaments may ſerve the turn. Since there is a poſſibility that it may do miſchief.

OBSERVATION XCIII.

The Gout.

MR. *Hamilton*, in the Flower of his Age, was miſerably tormented with the Gout, in the Joynt of his Right-ſhoulder; ſo that he had not ſlept in three Days and Nights. After I had preſcribed him a proper Diet, I purged him with Cochia Pills, gave him a Diuretic Decoction for ſome days, and then applied this Plaiſter to the place affected.

> R. *Gum. Galbanum diſſolved in Spirit of Wine, Tacamahacca diſſolved in Spirit of Turpentine, Emplaſter of Oxycroceum, an.* ℥ſ. *Mix them and ſpread them upon Leather*

This Plaſter ſtuck on eight days, within which time that immenſe Pain went off, ſo that he could freely move his Arm; after that, he returned to the Camp, where he was unfortunately ſlain.

ANNOTATIONS.

MAny Diſputes there are about the Cauſes of the Gout; but for my part, I believe there are neceſſarily two. For either thoſe Pains proceed from cold Defluxions, mixed with ſome Salt and Acrimony, falling from the Head upon the Joynts, refrigerating and corroding the Nerves, Tendons and Ligaments, annexed to the Joynts. For how great an Enemy Cold is to the Nerves and membranous Parts, we find in Winter-time, by the Wounds by which thoſe Parts are laid bare. *There*, ſays *Hippocrates*, *all cold things are fatal to the Nerves.* Beſides, that ſuch Defluxions cauſe Weakneſs and Stiffneſs of the Nerves, or too much Relaxation; ſo that being oppreſſed with weight, they are extended with Pains; but this ſort of Gout is not ſo terrible. For the ſecond Cauſe of the Gout proceeds from the ſalt, ſharp and tartarous Humors, ſeparated from the Blood, and thruſt forward upon the Joynts. *Therefore*, ſays *Sennertus*, *I muſt conclude, that a ſharp, ſalt, ſubtil Humor, neareſt to the Nature of ſalt Spirits, is the Cauſe of the Gout. Let any Man call it by what other Name he pleaſe, Choler, or Flegm mixed with Choler, Salt or Tartar, ſo the thing be rightly underſtood.*

In vain therefore Phyſicians have hitherto ſought, for the Cauſe of the Gout in the Heat and Drougth of Choler, or the Moiſture and Cold of Flegm, for they are not the firſt but the ſecond Qualities which induce thoſe Pains; that is, the Salt and the Acrimony which corrode and gnaw thoſe Parts. *Therefore*, ſays *Hippocrates*, *'tis not hot, cold, moiſt and dry, that have the acting Power, but bitter and ſalt, ſweet and acid, inſipid and ſharp, which if rightly tempered together, are no way troubleſome, but when alone and ſeparated one from the other, then they give the Vexation and ſhew themſelves*, &c.

In the Cure of the firſt, in regard the Cauſe proceeds from a depraved Diſpoſition of the Brain; therefore the Brain is to be evacuated and corroborated, to prevent theſe Excrements from gathering any more in that place. The Parts affected alſo are to be corroborated with Topics, warming the Parts, diſſipating and drying up the crude Humors.

In the Cure of the hot Gout, the ſalt Humors are to be evacuated and purged away by inward Medicaments, before they be puſhed forward into the Joynts, and that their Generation may be prevented. Topics alſo muſt be made uſe of to temper the Acrimony of the ſalt Humors, to diſſolve, diſſipate and evacuate by tranſpiration, thoſe Humors; the Forms of which, I ſhall give in another place.

OBSER-

OBSERVATION XCIV.

A Pain in the Stomach with Vomiting.

PEtronella *Beekman*, a Maid about twenty ſeven or twenty eight years of age, the nineteenth of *June*, was taken with an intolerable Pain in the upper part of her Belly, which extended it ſelf ſometimes to the Right, ſometimes to the Left, but moſt to the Sides. She had a Vomiting likewiſe, ſometimes more gentle, ſometimes vehement, which brought up all her Meat. Sometimes her vehement Vomiting brought a Pint, or a Pint and a half of black Water, with ſome tough Flegm: At the top of this Water ſwam certain little Bodies, about the bigneſs of a Filberd, in Colour and Conſiſtence reſembling Butter. When theſe came up ſhe had ſome eaſe for two or three hours, but then her pain returned again. She had no Fever, no Tumor in her Spleen, no Obſtruction in her Kidneys; and ſhe made Water without trouble, but very thick, neither did ſhe void any Gravel either before or after; nor was there any Diſtemper to be perceived in her Womb, where all things proceeded according to Nature; nor had bad Diet been the cauſe of her Diſtemper, but what that buttery Subſtance ſhould be, I could not certainly tell for my Life, only I conjectured that it might be ſome corrupt Choler, preternaturally chang'd into that Subſtance. However, the firſt thing I did, was to ſtop her Vomiting; to which purpoſe, I cauſed her Stomach to be anointed with Oyl of Nutmegs, and applied a warm Cataplaſm to it of Mint, Red Roſes, Nutmegs, Cloves, Maſtich, Olibanum, ſowre Ferment and Vinegar of Roſes, but all to no purpoſe. The next day, her Pains and Vomiting having very much weakned her, I gave her a corroborating Medicament of *Matthiolus's Aqua Vitæ*, Treacle and Cinnamon-water and Syrup of Limons, equal parts, to take frequently in a Spoon, which ſtay'd with her. The twenty firſt of *June*, I applied to the Region of her Stomach a corroborating Plaiſter of *Tacamahacca*, *Galbanum*, Cloves, Benjamin, and the like. The twenty ſecond, I gave her a gentle Purging Draught, which ſhe preſently brought up again; then I ordered her a Gliſter, which gave her two or three Stools, but her cruel Pain and Vomiting continued ſtill. The twenty fourth I gave her one Scruple of *Pill. Ruffiæ*, which ſtay'd with her, and gave her three Stools about Evening; and then, becauſe the Plaiſter was troubleſome, I took it off, and applied in the Room a Linnen Quilt filled with Mint, Wormwood, Sage, Flowers of Cammomil, Melilot, Dill, Nutmegs, Cumin-ſeed, Fennel, and Dill-ſeed; which Quilt was boiled in ſtrong Wine, and applied to her Stomach. The twenty eighth ſhe took another Gliſter. The twenty ninth about night, I gave her two Scruples of *Philonium Romanum*, prepared with *Euphorbium* in a little Wine, which cauſed her to ſleep that Night four hours, whereas ſhe had not ſlept till then from the beginning of her Diſtemper; the next day her Pain returned, nevertheleſs the *Philonium* ſeemed to have endeavoured ſome Concoction; for that ſhe began to belch, which gave her ſome eaſe; wherefore about Evening I gave her two Scruples of *Philonium*. The firſt of *July*, ſhe belched more freely, therefore that Evening I gave her *Philonium* again. The next day her Pains abated, and her Vomiting ceaſed, and at Noon ſhe ſupp'd a little Broth, which was the firſt Nouriſhment

ſhe

ſhe had taken ſince her Sickneſs. *July* the third, ſhe took *Pill. Ruffiæ* to looſen her Belly. The fourth of *July*, her Pains encreaſing, I preſcribed her an Amigdalate, but ſhe brought it up again. Therefore the ſixth of *July*, I gave her two Scruples and a half of *Philonium*, which cauſed her to reſt indifferently. The next day her Pains abated, ſo that at night the ſame Doſe of *Philonium* was again given her, as alſo the next Evening. The ninth of *July*, in the Morning, ſhe took *Pill. Ruffiæ*, and in the Evening *Philonium* again, and ſo for three Evenings more one after another; by which means her Pains and Vomiting ceaſed, her Appetite returned, and ſhe recovered her Health.

The twenty third of *November* ſhe was again taken with the ſame Pains and Vomiting; thereupon, after I had purged her Body with Pills, I gave her *Philonium* again, which gave her eaſe, and ſo continuing the uſe of *Philonium* for twelve Evenings together, and looſning her Body every day with Pills, at length I maſtered the Obſtinate Diſeaſe; ſo that for ſix years together, I knew her ſafe and ſound from that and all other Diſtempers.

OBSERVATION XCV.

A Baſtard Intermitting Tertian Ague.

HErman *N.* in the Vigor of his Age, in the beginning of *March*, was taken with a Baſtard intermitting Tertian Ague, which began with a great Coldneſs, and ended in a violent Heat; it came every other day, but at uncertain hours, ſometimes ſooner, ſometimes later. During the Fit, his Head ach'd violently, and he was very faint; his Stomach was gone, and his Strength much waſted. After he had taken many things in vain from other Phyſicians, coming to me, I gave him half a Dram of lucid Aloes reduced into Pills, which gave him five Stools; afterwards I ordered him to take dry Wormwood Mj. Leſſer Centaury Mij. Carduus Ben. Flowers of Cammomil, an. Mj. ſ. and to cut them all ſmall, and then boil them in three Pints of Small Ale for a quarter of an hour, and then to ſqueeze it out ſtrongly, and to take of the Straining warm, twice upon the Fit-Day, and thrice upon the Intermitting-day, and when that was done to make more; but this Decoction ſerved the turn, for the Ague vanquiſhed by this Medicine, laſted not above four Fits; after which time the Patient was fully cured, and his Stomach returned.

ANNOTATIONS.

THis Decoction, by which this Patient was freed from a long Ague, though it did not conſiſt of many coſtly far-fetch'd Ingredients, or prepared by laborious and pompous Chymiſtry, yet was compounded of ſuch Simples as are chiefly celebrated for the Cure of Agues. For Wormwood, Carduus and Centaury the leſs manifeſtly open all Obſtructions of the Bowels, concoct and remove Crudities, cut thick Matter, and reſiſt Putrefaction, and expel noxious Humors by Urine and Sweat, and are ſo well known among the Vulgar to have theſe Vertues, that they are able to be their own Phyſicians in the Cure of Agues, by the uſe of Powder of Carduus, Wormwood-wine, and Decoctions of Centaury. I added Flowers of Camomil, by reaſon of the Wind which troubles the Hypochondriums, and therefore of great benefit in Agues. *Camomil*, ſays *Galen*, *diſcuſſes and diſſolves Agues where there is no Inflammation of any Bowel; eſpecially ſuch as proceed from choleric Humors, or thickneſs of Skin. For which*

which reaſon, by the wiſe Egyptians it was conſecrated to the Sun, and was looked upon as a Remedy againſt all Agues, but in that miſtaken for it; only cures ſuch Agues as I have mentioned, and thoſe concocted. Though it helps the reſt, which are Melancholy and Flegmatic, and proceed from the Inflammation of the Bowels. For againſt thoſe it is alſo a potent Remedy, when they are once well concocted. Wherefore Cammomil is moſt grateful to the Hypochondriums. But though *Galen* tells us here that Cammomil is only to be uſed after Concoction of the Matter; yet in regard that of it ſelf it is very prevalent to promote that Concoction, cuts thick Humors, opens Obſtructions, removes Crudities, diſcuſſes Wind, and provokes Sweat and Urine; therefore it is thence apparent, that it may be given with ſucceſs before the Concoction of the morbific Matter. Thus *Sennertus* reports, that *Johannes Anglicus* was wont to give Cammomil promiſcuouſly, as well before as after Concoction, and that he always found it very advantagious; and therefore it was no wonder that our Patient ſucceeded ſo well with thoſe four moſt noble Febrifuges boiled together, and that the morbific Matter was ſo ſpeedily concocted, diſcuſſed and expelled.

OBSERVATION. XCVI.

Thunder-ſtruck.

IN the Year 1637, upon the twenty fourth of *Auguſt*, roſe a moſt terrible Tempeſt, with horrid thunder and Lightning. At that time a Servant of a Country-man of *Nimeghen* was abroad in the Field gathering in Harveſt, having with him a Girl, an old Woman with a Child, and a Cart with one Horſe; they terrified with the Tempeſt fled, and the old Woman with the Child crept under the Cart, while the Servant and the Girl were endeavouring to bridle the Horſe. In the mean time a violent Thunder-clap ſtruck the Servant, the Girl, the Cart and Horſe, the old Woman and the Child receiving no harm. The Beam of the Wagon made of ſtrong Wood, was broken into Shivers; the Horſe fell down dead of a ſuddain, and yet nothing of hurt appeared outwardly; the Girls Right-thigh and Leg were both ſtruck by the Thunder, ſo that all the Parts appeared black, blew and purple; beſides that, her Peticoat and Smock were torn into long Rags; the Girl alſo was thrown to the Ground and lay ſpeechleſs for two hours. The Servant was maim'd over all his Body, eſpecially upon his Right-ſide; from which Side, his Doublet, Breeches, Drawers and Shirt were not only torn, but ſhivered into long Rags, and retained a vehement ſtink of Fire, as if they had been burnt for Tinder. His Right-ſhoo, made of very ſtrong Leather, was raſh'd into long Thongs, and caſt thirty Paces from his Foot. By ſuch a vehement Stroke the young Man being lay'd proſtrate upon the Ground, fell into a Swoon, and was carried home for dead: This Fit laſted for two hours, and then he came to himſelf. I ſaw the Man, and viewed his whole Body, and found his Right-ſide from Head to Foot all of a Colour, between black and purple, his Skin ſtead off in ſome places; there was alſo a very great Contuſion, and a burning fiery Heat joyned with it. The Patient ſpoke very little, only complained of a violent Pain of his whole Side, an extraordinary Heat of his Heart, a Compreſſion of his Breaſt, and Difficulty of Breathing; he could not move the Joynts of his Right-ſide, and remained ſo diſabled for two months. Being asked what he firſt felt, he anſwered that at the very moment that he was ſtruck, he thought his Heart had been burnt with a red hot Iron; neither could he draw his Breath, which was the reaſon that he fell down as if he had been ſtifled. I gave him ſeveral things,

and

and applied ſeveral Topics to the Parts affected; but nothing availed againſt that æthereal Fire; till at length, the Patient, by Divine aſſiſtance, was cured without the help of any Medicaments. The old Woman, that with the Infant eſcaped under the Cart, related that ſhe ſmelt a moſt horrible Stink when the Stroke was given, and felt ſuch a violent Heat, as if her Head had been in a Bakers Oven, ſo that for the time ſhe could hardly draw her Breath.

ANNOTATIONS.

With what a violent force, and how wonderfully Thunder ſometimes ſtrikes inferior things, both antient and modern Teſtimonies ſufficiently convince us. In the Year 1626. eight days before *Eaſter*, roſe a very great Tempeſt, with Thunder and Lightning; at what time, with one Clap of Thunder, four Houſes and ſix Barns were quite overthrown in *Blockland* near *Montfort*, and above three thouſand Trees, not only broken, but torn up from the Roots, and caſt at a great diſtance from their Holes, neither Men nor Beaſts receiving any harm. In the Year 1628, a Country Man was killed in the Fields near *Bodegrave* with a Flaſh of Lightning, his Bones being broken to bits, yet neither his Skin or Fleſh endamaged. In *France* at *Poitou*, in a certain Tower, we ſaw the Rafters burnt, the Lead being untouched; nor was the Fire quenched without a great deal of trouble. In the Year 1638, at *Nimeghen*, in the Walk called the *Calves-wood*, above a thouſand Birds were kill'd at one time by the Lightning; and while the ſame Tempeſt laſted, ſome Oxen were killed by the Lightning, having their Bones broken, and ſeveral Trees were thrown down and broken, having their Leaves ſcorched and parched by the Flame. *Cardan* reports, that in the Year 1521, the Caſtle of *Millain* was almoſt demoliſhed by Lightning, at what time a hundred and thirteen Men were kill'd. *Hildan* tells a remarkable Story of a Gentleman, who was Thunder-ſtruck himſelf, at what time his own Horſe, and his Man with another Horſe were both killed out right. The Gentleman's Cloaths were torn to Peices, and his Sword melted, the Scabbord, receiving no harm; only that the Iron *Chape* was melted at the ſame time. Therefore ſays *Cardan*, upon this; *Motion not only cauſes a greater Penetration, but kindles the Heat it ſelf, and renders the Fire hotter. Therefore it is no wonder there ſhould be ſuch a force in Lightning, and that a Fire ſo different from the Nature of other Fires, ſhould work Miracles; for by reaſon of the Swiftneſs of its Motion, it not only penetrates more, but the Fire is alſo hotter than any other Fire: For what other Fire is there that kills by touching? This is peculiar to this Fire; that is, the hoteſt of moſt hot; or as I may ſay, the Fire of Fires: And therefore ſometimes it melts the Money in the Purſe, and leaves the Purſe untouched*, &c.

OBSERVATION XCVII.

A Cough.

Nicolaus Kerckwegg, in the Vigor of his Age, was troubled with a lamentable Cough for three or four years; he was nothing but Skin and Bone, and ſeemed to be perfectly Ptiſical. When, after he had tried ſeveral others in vain, he came to me; I examined the Condition both of the Perſon and the Diſeaſe; I looked upon his Spittle, which was ſlimy and tough, without any Matter or Blood, therefore I could not judge him to be in a real Conſumption, but that the Cough proceeded from a Cathar falling upon his Lungs, which in a long time of continuance, had weakned, not only his Lungs, but his whole Body. For Cure, I preſcribed him a proper Diet, and ſome few Remedies, for that his Antipathy againſt Phyſic, and his Weakneſs,

neſs, would not permit me to give many. Therefore, having gently purged his Body, I ordered him to take a Draught of the following Decoction three or four times a day.

℞. *White Horehound* M. iij. *Shred it ſmall, and ſteep it all night in common Water* ℔j. ſ. *to which, the next day, add the Head of one white Poppy ſhred into bits, Leaves of Hyſſop* M. j. *Oxymel* ℔j. ſ. *Boil them in an earthen Pipkin cloſe ſtopped, to the Conſumption of the third Part, and keep the Straining for your Uſe.*

This Decoction he continued for three or four months till at length the Cough abated every day more and more, and at length ceaſed; the Man alſo having recovered his Strength, and growing fat and luſty, ſo continued without any further Moleſtation.

OBSERVATION XCVIII.

An Uterine Suffocation.

THE Wife of a Brick-layer at *Nimeghen*, about twenty eight years of Age, in *July*, was troubled with a Suffocation of her Womb with a great pain in her Left-ſide, and difficulty of Breath. Being ſent for about Evening, I gave her the following Draught, which when ſhe had taken, the Malady ceaſed in part, and ſo ſhe ſlept quietly that Night.

℞. *Engliſh Saffron, Caſtoreum an.* gr. v. *Trochiſchs of Myrrh* ʒſ. *Prepared Amber* ʒj. *Treacle* ʒij. *Treacle-water* ʒj. *Mugwort* ʒſ. *Oyl of Amber* gut. ix. *Mix them for a Draught.*

The next day her Fit returned with the ſame vehemency, and becauſe ſhe had not been at Stool in three or four days, I gave her this Purge.

℞. *Leaves of Senna* ʒſ. *Lovage-ſeed* ʒj. ſ. *Mugwort-water* q. ſ. *Make an Infuſion, then add to the Straining Elect. Diaphenicon, Hiera Picra, an.* ʒj. ſ. *For a Potion.*

This gave her five Stools; the Suffocation remaining, nay, growing more violent than before, wherefore I preſcribed her the following Decoction, of which ſhe drank warm an ounce, or an ounce and a half every hour, which after ſhe had continued the whole day, her Evacuations came down, and the Suffocation vaniſhed.

℞. *Roots of Maſterwort, Valerian, an.* ʒſ. *Dittany, Briony, an.* ʒiij. *Savine* M. j. *Seed of Lovage* ʒvj. *Of wild Carrots* ʒij. *White-wine* q. ſ. *Boil them for an Apozem to* ℔j. ſ.

OBSERVATION XCIX.

Deafneſs.

THE Wife of *Henry Jordens*, in the Month of *Auguſt*, complained that for half a year ſhe had been troubled with a very great Deafneſs, ſo that ſhe could hear nothing but very loud Noiſes. She was about forty years of age, and during this Deafneſs, had been all along very hard bound in her Body, ſo that ſhe ſeldom went to Stool in four or five days; for which reaſon, I judged that many Vapors aſcended up to her Brain, which furring the auditory Nerve and Tympanum, cauſed this Deafneſs: Thereupon, after I had well purged her Body with Pills, I ordered her every Evening when ſhe went to Bed, to ſwallow two Pills of Lucid Aloes, about the bigneſs of a Pea; by taking of which, her Body was naturally looſned, and ſo that great Deafneſs, within a Fortnight, was quite taken away, to the Admiration of many.

ANNOTATIONS.

THE Head, like a Lembick, receives the Vapors of all the Parts that lye underneath: Which if they are carried thither in greater abundance than can be digeſted and diſcuſſed by the Brain, cauſes various Diſeaſes of the Head, Pains, Catarrhs, Ophthalmies, Deafneſs, *&c.* And this abounding Aſcent of copious Vapours, chiefly happens to thoſe that are bound in their Bodies. For this reaſon, if the Deafneſs have not been of a very long ſtanding, then the Malady is eaſily cured by looſning the Body; by which means the morbific Matter is derived to the Inteſtines: Which *Celſus* intimates; where he ſays, *Nothing more prevails againſt Deafneſs than a Choleric Belly.* For which, *Galen* gives this Reaſon, becauſe that Choler being carried to the Auditory Paſſages, and cauſing Deafneſs if it be removed from thoſe Parts to the lower Parts, the Deafneſs is cured by Choleric Stools. Neither is this only true in Deafneſs, but in Ophthalmies, and other Affections of the Head, according to that Saying, *All Stools below remove the Diſeaſes of the Superior Parts:* Which is to be underſtood not only of Evacuations of Choler, but of all other Evacuations by Stool. *Hippocrates* and *Celſus* ſpeak particularly of Choleric Humors, becauſe they occaſion Deafneſs more than any other Humor, in regard that Choler has a familiar paſſage to the Ears; as appears by the Bitterneſs of the Excrement of the Ears: Which *Mercurialis* believes that Nature carries thither, meerly to cleanſe the Auditory Organ, and keep it clean. Wherefore in ſuch Maladies of the Head, purging Medicins that mollifie the Belly, are of great uſe; partly to hinder the Aſcent of ſuch Humors and Vapors; partly to draw off ſuch as are already got up into the Head; of which, we ſaw the happy Event in our Patient. For though there be no conſpicuous Paſſage for the Deſcent of thoſe Humors from the Brain, yet Nature finds out ways unknown to us, by which ſhe evacuates the Morbific Matter, and rids her ſelf of many Diſtempers.

OBSERVATION C.

The Itch.

A Young Gentlewoman had got the Scab, which chiefly infeſted her Hands with an extraordinary Itching. This Malady had continued for half a year, and becauſe it began to ſpread more and more, I was ſent for: Thereupon, after I had purged her Body, I ordered

dered her to waſh her Hands with equal parts of mercuriated Water and Virgins Milk, and to let them dry of themſelves. By which means the Scabbineſs came forth more and more for two or three days, but within three or four days afterwards, wholly dry'd up, and was cured.

OBSERVATION CI.

A Malady in the Stomach.

ISaac of *Aix la Chapelle*, forty ſix years of age, was troubled with an old Diſtemper in his Stomach, occaſioned by difficult and painful Belchings; ſo that after he had eat or drank any thing, he was forced to belch fifty, and ſometimes a hundred times and more, and that often both by day and by night; neither could he ſtop them; or if they did not break forth, he was like one that was ready to burſt. Beſides, his Sight was very weak, ſo that he could not ſee to read or write without Spectacles, and that at a very near diſtance too, and thus he had been troubled from the twentieth year of his Age till then. He had had the Advice of ſeveral Phyſicians to no purpoſe; upon which, I deſired him to try only one Experiment, which was to ſmoak one Pipe of Tobacco after Dinner and Supper. At firſt he took but half a Pipe, but afterwars he grew ſuch a Proficient, that he would take two or three; ſo that after he had continued the uſe of Tobacco in that manner for about a month, his Belching ceaſed, and his Sight was much amended.

ANNOTATIONS.

NIcholas *Monardes* writes, that Tobacco is hot and dry in the ſecond degree, and therefore attenuates, concocts, cleanſes, diſcuſſes, aſſwages Pain, and has a ſtupifying Quality, is good againſt the Tooth-ach, allays all Pains of the Head being outwardly applied, and laid upon the cold Stomach, cures the ſame, *&c.* Which Qualities, *Dodonæus* acknowledges alſo in *Tobacco.* But in regard that in their time this Plant was not ſo much in requeſt, the Benefit and Abuſe of it was leſs known to them than to us.

Practical Disputations

OF

Isbrand de Diemerbroeck,

Concerning the

DISEASES

OF THE

HEAD, BREAST and LOWER BELLY.

The Cures of the chief Diseases of the whole Head, in Twenty Five Disputations, annexed to the Cases of the Patients themselves.

HISTORY I.

Of the Head-ach.

A Person of forty years of age, of a Flegmatic Constitution, often liable to Catarrhs, in the midst of VVinter, in a very cold Season, had travelled for forty Days together, and by the way had fed upon flatulent, viscous Meats, of hard Digestion, and other such kind of Food, to which he had not been accustomed, and instead of VVine, he had been forced to drink thick muddy Ale. Upon his return home, he complained of a troublesome Pain in his Head, more heavy and obtuse than acute, which if you laid your hand hard upon the

the place, was so far from being exasperated, that it was more gentle for the time. This Pain was also accompanied with Noises in his Ears, an Inclination to Sleep, which his Pain however would not permit him to take, and a want of Appetite, a Lassitude of the whole Body, and Paleness in the Face.

I. IN this Patient we find the Head to be first affected, by the Pain thereof, and the Noise in his Ears: Whence, by consent, the whole Body suffers, as appears by his Lassitude and other Simptoms.

II. The Malady of which he chiefly complains, is a Pain in the Head; which is a trouble to the Sense of Feeling in the membranous Parts, caused by the Solution of the *Continuum*.

III. This Pain is internal, in the Parts contained within the Skull; as is from hence apparent, for that it is not exasperated, but somewhat mitigated by laying the Hand hard upon the Part.

IV. The remote Cause of this Malady is disorderly Diet; by which means, by the use of Meats of ill Juice and hard Concoction, several crude and flegmatic Humors are generated in the whole Body, but especially in the Head, which produce the Antecedent Cause; which being encreased by the external Cold, wherein he had traveled for four days together, and fixed in the membranous Parts of the Brain, occasioned the containing Cause.

V. These flegmatic Humors being by the external Cold condensed in the Head, and not being evacuated through the Pores, obstructed by the Cold, or other Passages appointed for the Evacuation of the Excrement, were gathered together in great abundance in the Passages of the Brain, and by reason of their quantity distending the membranous Parts of the Brain, and dissolving the *Continuum*, caused the Pain.

VI. The Cure is to be hastned, for if that flegmatic Humor stay long in the Head, 'tis to be feared that the Malady may turn to a heavy Drowsiness, or an Apoplexie, or if it dissolve too soon, and make too improper a way, least it cause some dangerous Catarrh, which falling upon the Lungs or lower Parts may endanger a violent Cough or Suffocation, or some other desperate Distemper in some other part.

VII. Four Indications are here to be considered in order to the Cure. 1. That the abounding Flegm be evacuated from the Head and whole Body. 2. That it be specially evacuated out of the Head it self. 3. That the Pain be allay'd. 4. That the Head be strengthened, and the Concoctions of the Bowels be promoted, and so a new Generation of abounding Flegm, as well in the Head as whole Body, be prevented, and that the Flegm already generated and abounding may be consumed.

VIII. For the Evacuation of Flegm abounding in the whole Body, let him take this purging Draught.

℞. *Trochischs of Agaric* ʒj. *Leaves of Senna cleansed* ℥ſ. *Anise-seed* ʒj. ſ. *White Ginger* ℈j. *Decoction of Barley* q. ſ. *make an Infusion. Then add to the Straining Elect. Diaphœnicon* ʒij. *Diagredion* gr. iiij. *Mix them for a Draught.*

If the Patient cannot take this, give him of *Pill. Cochiæ* ℈ij. or iij. or else ʒj. of Powder of *Diacarthamum*, or *Diaturbith* with Rhubarb. This Purgation must be repeated to prepare the Humors three or four times every three or four days one after another.

IX. For Evacuation of the Flegm, particularly accumulated in the Head, Sternutories and Errhines are of great use. The one, because they draw down viscous and tough Humors through the Nostrils and Palate. The other, because the Brain being by them provoked, and violently contracting it self, as violently expels tough Humors sticking to the *Ethmoides* Bone, and by removing the Obstruction, makes way for the Excrements detained therein.

X. Of this Sneezing-powder, let him twice or thrice a day snuff up a little into his Nose.

℞. *Mar-*

℞. *Marjoram Leaves* ℈j. *Root of white Hellebore* ℈j. ſ. *Pellitory of* Spain ℈ſ. *Black Pepper, Benjamin, an.* gr. v.

If Sneezing prevail not, let him ſnuff up a little of the following Errhin into his Noſtrils.

℞. *Juice of Marjoram* ʒſ. *Juice of the Root of white Beets* ʒj. *Mix them for an Errhin.*

XI. In the mean time, to allay the Pain, anoint the Fore-head, Temples and Top of the Head with Martiate or Alabaſtrin Oyntment, mixed with a ſixth part of Oyl of Dill; or a Cataplaſm of Flowers of Cammomil, Melilot and Dill; adding a little Nutmeg and Saffron with as much of the Crum of White-bread and White-wine as is ſufficient, and lay it between two Linnen Rags to the Temples and Fore-head; but beware of all Narcotics.

XII. For the Corroboration of the Head, and the reſt of the Bowels, and Diminution of the Flegm, External and Internal Medicaments are proper, and a convenient Diet.

℞. *Roots of Calamus Aromatic. Elecampane, Fennel, an.* ʒſ. *Galangale* ʒiij *Herbs, Betony, Marjoram, Roſemary Hyſſop, Baum, Thyme, an.* M. j. *Sage Flowers of Cammomil, Stœchas, an* M. ſ. *Seed of Fennel, Aniſe, Caroways, an* ʒſ. *Juniper-berries* ʒvj *Raiſins cleanſed* ʒij. *Common Water and White-wine equal Parts. Boil them and make an Apozem to* ℔j. ſ. *with which, mix Syrup of Stœchas* ʒij. *or* iij.

If after he has taken this, there requires more Exſiccation ſtill, the ſame Simples may be boiled in a Decoction of *Guaiacum, Saſſaperil* or *Saſſafras*, which will make the Medicine more effectual. Let him continue this Decoction for ſome time, or if at length it prove diſtaſtful, let him often take of this Conditement.

℞. *Specier. Diambra* ℈iiij. *Aromatic. Roſatum* ℈ij. *Ginger condited, Conſerve of Flowers of Sage and Roſemary, an.* ʒſ. *Syrup of Stœchas* q. ſ. *For a Conditment.*

XIII. And in regard that Topics are of great uſe to corroborate the Head, and fetch down cold Humors therein remaining, let him anoint his Temples and fore-part of the Head upon the Coronal Suture with this Liniment.

℞. *Oil of Nutmegs preſſed* ʒj. *Oils of Thyme, Roſemary, Dill diſtilled, an.* ℈j. *Mix them for a Liniment.*

After this Anointing, put upon the Head the following Quilt.

℞. *Leaves of Roſemary and Marjoram, an.* ʒſ. *Flowers of Melilot, Red Roſes and Lavender, an.* ʒj. *Root of Florence Orrice, Nutmegs, Cloves, Benjamin, an.* ℈j. *Beat them into a groſs Powder for a Quilt.*

Let him wear this a Month or two upon his Head.

XIV. Let the Patient keep a proper Diet; live in an Air moderately hot: Let his Food be Meats of good Juice, hot and eaſie of Digeſtion, ſeaſoned with Roſemary, Marjoram, Stone-Parſly, Sage, Betony, Hyſop, Pepper, Ginger and other Spices. His Drink, ſmall Wine or Mede, or midling Ale. Let him not ſleep long, and uſe moderate Exerciſe. Let him keep his Body ſoluble. Let him avoid Sadneſs, Melancholy and ſudden Frights, and keep himſelf in an even Temper, free from Paſſion.

HISTORY II.

A Phrenſie.

A Stout young Man, of a Choleric Conſtitution, abounding with Blood, and living intemperately, having drank over freely at a Merry-meeting, and thereby over-heated, at length, being affronted by one of the Company, fell into a moſt violent Paſſion; yet being hindred from his preſent Revenge, and carried Home, never ſlept all that Night, but like a Mad-man ran about his Chamber, talking of nothing

nothing but Brawls, Fighting, Wounds and Revenge; and that with great Rage, and many Follies intermixed, The next Day he was absolutely mad, and began to lay violent Hands upon the Servants, so that he was forced to be held by lusty Men. The next Night he continued waking with an extraordinary Delirium and Fury, picking Straws and the Bed-cloaths, sometimes flying upon those that were in the Room. His Eyes were red, his Looks furious and wild, he bawl'd and roar'd, was very thirsty, severish, and his Urine pale. **The third** Day the Physicians were sent for.

I. THE continued and raging Delirium, with his Waking shewed that the Brain of this Patient was distempered, and the Fever was a Sign that his whole Body was out of order.

II. The Disease was an Inflamation of the Membranes of the Brain, and thence a hot Distemper of the Brain and Spirits, which caused the Fever; and that the Commotion of his Mind, which the Physicians call a *Phrensie, which is a raging and continued Delirium, with a continued Fever, arising from an Inflammation of the Membranes of the Brain.*

III. The remote Cause was Intemperance in Diet, which engendring a great quantity of choleric Blood in the Body, occasioned the antecedent Cause. Which choleric Blood being heated by excess of drinking Wine, and carried in greater quantity to the Head, and there powred into the Substance of the Membranes of the Brain, constitutes the containing Cause of this Distemper, which Disease this Simptom follows.

IV. For the hot Blood flowing over copiously into those Membranes, and there putrifying inflamed them; and part of that Putrefaction being communicated through the Veins to the Heart, and thence expelled hotter through the Arteries to the whole Body, kindles the Fever, which causes the extraordinary Drought of the Gullet and Mouth.

V. This Inflammation of the Membranes infects with a hot Distemper the Brain it self, and Spirits, whose extream Heat, Mobility and inordinate Motion, deprave the principal Functions of the Brain, and so breed a Delirium, which proves raging and continued, because of the extream and continued Heat, and rapid Motion of the fervent Spirits.

VI. This Disease is dangerous for several Causes. 1. Because the principal part is affected. 2. Because continual Waking weakens the Patient. 3. Because this Delirium is not accompanied with Laughter but with Raging. 4. Because the Inflammation is thereby much augmented and fomented, and the Choleric Matter which uses to dye the Urine is carried all to the Head, and leaves the Urine pale. Only there is some hopes of Cure, because there is no decay of Strength, or appearance of bad Simptoms, as Convulsions, loss of Speech, Hickupings, Gnashing of Teeth, or the like; and therefore Cure must not be delay'd till the Patient grow worse.

VII. This Cure consists in taking away the antecedent and containing Cause, and Correction of the ill temper of the Parts.

VIII. The choleric Blood which flies to the Head, is first to be evacuated, drawn back, derived, and repelled. And therefore after an emollient Glister given, open a vein, first in one Arm, and take away ten or twelve ounces of Blood; the next day in the other, and the third day again, if there be necessity, in the Vein of the Fore-head.

IX. To evacuate the choleric Humors, give this Draught.

℞. *Rubarb the best, Leaves of Senna, an.* ʒij. *Rhenish Tartar* ʒiij. *Anise-seed* ℈j. *Succory Water* q.s. *Make an Infusion, then add to the Straining Elect. Diaprunum solutive* ʒiij. *Diagridion* gr. iij. *Mix them for a Draught.*

The next Days, if he be bound, let him be loosned with Glisters, and the third or fourth day give him the foresaid Purge again.

X. Let his Temples and Fore-head be anointed twice or thrice a day with the following Liniment.

℞. *Populeon Oyntment* ʒvj. *Oyl of Poppy* ʒiij. *Mix them for a Liniment.*

After

After anointing, apply the following Oxyrrhodine, with rags luke warm to his Fore-head.

℞. *Oyl of Roſes* ℥ij. *Juice of Lettice* ℥iij. *Juice of Houſleek, Roſe-water, Vinegar of Roſes, an.* ℥j. ſ. *Mix them well together.*

XI. For diverſion of the Morbific Matter, apply Pidgeons diſſected alive to his Feet, or elſe this following Medicine.

℞. *Leaves of red Cabbage, white Beets, an.* M. j. ſ. *beat them in a Mortar, and make them into a Paſt with ſowre Leven* ℥iiij. *Salt* ℥ij. *Vinegar of Roſes* q. ſ.

XII. About Night, give gr. iiij. of *Laudanum* in a Pill, or if he refuſe a Pill, diſſolve three Grains of that *Laudanum* in one ounce of Decoction of Barley, adding an ounce of Syrup of Poppy Rheas to provoke Sleep.

XIII. While theſe things are done, for his uſual Drink, give him ſmall Ale, or Whey of ſowr Milk or Fountain Water, having ſome Pieces of Citron ſteeped in it, adding a little Sugar and Roſe-Water, or elſe this Julep.

℞. *Lettice Leaves* M. iiij. *Endive* M. ij. *Red Currants* M. j. *Barley-water* q. ſ. *Boil them to a Pint; to the Straining when cold, add Syrup of Violets and Limons, an.* ℥j. *of Poppy* ℥ſ. *Juice of Citron* q. ſ. *to make it pleaſing.*

XIV. Let him alſo take of this Conditement often in a day.

℞. *Powder of Diamargarite cold* ℈ iiij. *Pulp of Tamarinds, Conſerve of Violets, pale Roſes, Robb of red Currants, an.* ʒ iij. *Syrup of Violets* q. ſ.

About Evening, when he does not take his *Laudanum Opiate*, let him drink one or two Draughts of this Emulſion.

℞. *Four greater Cold ſeeds, an.* ʒ ij. *Seed of white Poppy* ℥ ſ. *Decoction of Barley* q. ſ. *Make an Emulſion of about* ℥ vij. *To which add Syrup of Violets and Poppy Rheas, an.* ʒ v.

XV. When the Diſtemper begins to aſſwage, the ſooner to diſſolve the peccant Matter, cut alive Hen in the middle, and lay it to his Head, or elſe the Lungs of a Calf or Sheep newly killed.

XVI. Let his Air be between cold and moiſt, and his Chamber ſomewhat dark. His Diet ſparing and cooling, prepared with Lettice, Endive, Borrage, Sorrel, and the like; his Drink as before. Let him not be troubled with much company nor Talk. Only let thoſe, for whom he had a Kindneſs in his Health, endeavor now and then to pacifie his Rage with good Words. Laſtly keep his Belly ſoluble.

HISTORY III.

Of Melancholly.

A Learned Man, forty years of age, of a melancholly Conſtitution, in the Summer time, walking out of the City with a Son of his, came to the River ſide, pulling off his Cloaths, leapt into the Water, to pleaſe himſelf with Swimming, to which he perſwaded his Son likewiſe, to make him skilful of the ſame Art; but his Son leaping into the Water, ſunk to the bottom, and was drowned before his Father could come to his Aſſiſtance. Upon which, the Father fell into ſuch a deep Sadneſs, continuing thinking of his Misfortune, and believing himſelf the Author of his Childs Death, that he did nothing but weep Day and Night, without ſleeping; and within a few Days, was brought to that paſs, that he believed himſelf guilty of Murther, and for that reaſon eternally damned. He alſo thought the Devil, who had tempted him to do the Fact, always ſtood at his ſide, and ſhewed his horrid Shape to thoſe that ſtood by, pointing at him with his

Finger, wondring they did not see him, as well as He. As to other things he was well enough; only this false Imagination stuck so deeply in his Mind, that no Perswasions or Consolations of his Friends could root it out.

I. When the seat of the Principal faculties in the Brain was endamag'd, and the Imagination deprav'd, it was a sign the Patients Brain was out of order, as appeared by his sadness and fear.

II. This Malady is Melancholly, and a deprav'd Distemper of the Brain, hurting the Imagination, and deluding it with false Apparitions, and causing fear and sadness without any reason; which are two unquestionable Signs of Melancholly, according to *Hippocrates*. Therefore we may well define Melancholly to be, a *Delirium* without a Fever, arising from a Melancholly Fancy.

III. The first and external Cause of this Mans Malady, was his grievous Misfortune, having his Son drown'd, which seiz'd him the more violently, as being naturally Melancholly. Which when he could not forget, but spent whole Days and Nights, continually thinking upon it without any Sleep, the Animal Spirits, prone to Melancholly, were disorderly agitated in the Brain, and so contracted a Specific and Ocult distemper, which they communicated not to the Brain, but to the Heart and whole Body: Hence horrible thoughts, sadness and fear.

VI. When he thought of his Son, whom, he believed to be drown'd by his fault, he perswaded himself he was guilty of Murder, which because he knew it was a Sin hateful to God, therefore he thought himself Damn'd, and the Devil to be always at his Elbow; the continual thinking upon which, had shaped the Idea of a Devil, so firmly in his mind, that he could not be otherwise perswaded, but that the Devil was always before his Eyes, nor could any Body dispossess him of that Imagination. In other things he was well, because his perception and judgment of things was no way hindred by that false Imagination: as being wholly taken up with that Imagination, and nothing so much, nor with such an emotion of Mind intent upon other things.

V. Because this occult Distemper of the Brain and Animal Spirits was bred in the Brain, plain it is that this was a primary or self-suffering Melancholly.

VI. This Melancholly *Delirium*, tho' very troublesom, yet is it not Mortal; and gives great hopes of Cure, because only the Imagination is depraved, the Ratiocination and Memory little endamaged; then again, he was sound in Body, and lastly, because he was a Learned Man, and so much the sooner to be governed by Reason: besides that it was in the Summer when this happened; which was a Season more proper for Cure.

VII. In the Cure the Evil Melancholly Matter, and the ill Temper of the Brain is to be amended, that the purer Spirits may be freed from that Specific Melancholly, Contamination and generated anew. The same evil Matter is also to be evacuated, and his Head to be corroborated, and all means try'd to take off the Patients thoughts, from false and horrible Imaginations.

VIII. First, therefore Purge him with this Bolus.

℞. *Confection Hamech, Elect. Diaphœnicon an* ℥ j. ſ. *Diagridion* gr. vij. *Mix them.*

Or if he will not take that, give him this Glister.

℞. *Emollient Decoction to which an Ounce of the Leaves of Senna has been added* ℥ix. *Elect. Diaphœnicon* ℥ ij. *Oyl of Camomil* ℥ j. ſ. *Salt.* ℥ j.

IX. Because such a Patient has not much Blood, therefore to preserve his strength, there is no Blood-letting to be used, unless there be a Palpitation of the Heart, or any such Symptom which requires it.

X. After the Belly is well cleansed, to prepare the Melancholly humor, and strengthen the Head, let him drink three or four times a day, a draught of this Apozem.

℞. *Root of Polypody of the Oak* ℥ j. *Calamus Aromatic. Fennel, rind of Caper-roots, Tamarisch an.* ℥ ſ. *Herbs Baum, Borage, March Violets, Tops of Hops, Betony, Germander, Majoram an.*

an. M. j. *Flowers of Stœchas* M. ſ. *Cordial Flowers, an. one little handful, Citron and Orange Peel an.* ℥ iij. *Seeds of Fennel and Caraways an.* ℥ j. ſ. *Currants* ℥ ij. *Water and Wine equal Parts. Make an Apozem for a Pint and a half, to which mix Syrup of Stœchas and Borage an.* ℥ j. ſ.

XI. After this preparation, Purge with this Potion.

℞. *Leaves of Senna* ℥ ſ. *White Agaric* ℥ j. *Aniſe-ſeed* ℥ j. *Ginger* ℈ j. *Decoction of Barly* q. ſ. *Infuſe them all Night. Then add to ſtraining Confect. Hamech* ℥ iij.

XII. This done let him take this Apozem again, and continue it for ſome time, looſing his Belly every three or four days either with the foreſaid draught, or *Confect. Hamech*, or *Cochia Pills*, or *Meſues* and compounded Syrup of Apples, highly commended by *Rondeletius* in this Caſe.

XIII. After every Doſe of his Apozem, as alſo after Dinner and Supper, let him eat the quantity of a Nutmeg of this Conditement.

℞. *Specier. Diambr. ſweet Diammoſch Dianthos an.* ℈ ij. *Candid Citron and Orang Peels, an.* ℥ iij. *Conſerve of Flowers of Borage, Baum, and Roſemary, an.* ℥ ſ. *Confect. Alkermes,* ℈ j. ſ. *Syrup of Citron Rind.* q. ſ. *Mix them, for a Conditement.*

XIV. In the midſt of theſe Cures, peculiar Evacuations of the Head will not be amiſs, either by Maſticatories or Sternutories made of Marjoram, Githſeed, Roots of white Hellebore, and Pellitory, or the like.

XV. Great care is to be taken to provoke the Patient to ſleep. Therefore for his Supper give him ſometimes a Hordeate or Amygdalate, made with a Decoction of Barly and Lettice, with which if he be hard to ſleep, mix one Ounce of Syrup of Poppys or more. Or if theſe avail not, of the Maſs of Pills of Storax fifteen grains, or of *Laudanum Opiat.* three grains; but this not often: When he is not ſo much troubled with Waking, it will ſuffice to anoint his Temple with Oyntment of *Populeon*, mixt with ſome few grains of *Opium.* Though Narcotics are to be uſed as little as may be, for fear of accuſtoming the Patient too much to the uſe of them.

XVI. His Diet muſt be ſuch as breeds good Blood, and corrects all the qualities of Melancholly Humors; eaſie of Digeſtion, moderately hot and moiſt, prepared with Barly cleanſed, Borage, Baum, Bugloſs, Marjoram, Raiſins, Betony, *&c.* avoiding Leeks, Onions, Garlic, Cabbige, Fiſh long pickled, or dry'd in the Smoak; and whatever beeds ill Juice and Melancholly nouriſhment: let the Patient be moderate in his Diet, neither too full nor too empty: Let his Drink be ſmall, with a little Baum, Roſemary or other ſuch Herb mixt with it: Let his Exerciſes be moderate: His ſleeping time much longer: Let his Body be kept ſoluble. And which is of great moment in this Cure, let his Mind be taken off from all manner of ſadneſs and thoughtfulneſs; and all occaſions of fear and grief be avoided; while his friends on the other ſide labour with grateful Arguments to perſwade him of the vanity and falſehood of his idle Dreams and Imaginations.

HISTORY. IV.

Of Hypochondriac Melancholy.

A Noble *German* of forty Years of Age, of a Melancholy Conſtitution having ſuffered deeply in the calamities of the late *German* War, as Captivity, Exile, Famine, and other Miſeries, which had reduced him to an ill ſort of Diet; the long uſe of which had begot wind, roarings and diſtenſions about his Midriff, and a troubleſom Ponderoſity eſpecially about his left *Hypochondrium*, with difficulty of reſpiration, and a palpitation of the Heart, though not continual, with loſs of Appetite, which made him ſad, fearful, and thoughtful; till at length underſtanding the death of his Wife, he became ſo conſternated

sternated, that no perswasive and kind Language could asswage his sadness; so that through continual watching, restlessness, horrible thoughts, and want of sleep he began to rave at first by intervals, but afterwards without ceasing; he thought every Body came to kill him, and therefore sought retirement, and avoided Society. No body but Servants entered his Chamber, and of them he was afraid too: if any other Persons came to visit him, he besought them not to Murder him unprovided, but to give him time to prepare himself for Death; he only seemed to trust his Physitian, from whom he often desired Antidotes against Poyson, which he assured himself were often mixed with his Meat, and took any Medicaments that were brought him.

IN this Person thus Distempered, various Parts were grievously afflicted, especially the Brain, as appeared by the Delirium, and the Bowels of the middle and lower Belly, which the Palpitation of his Heart, difficulty of breathing, distention and ponderosity of his *Hypochondriums* and loss of Appetite plainly demonstrated.

II. The Symptom that chiefly infested, is called Melancholly, which is a Delirium without Rage or Fever, arising from a Melancholly Phantasm.

III. The remote Causes of this Malady are Fear, Terrors and Grief, occasioned by Misfortunes, which had long troubled and disordered the Spirits in their Motion: to which an ill Diet mainly contributed. For thereby Crudities were bred in the Bowels of the lower Belly; thence Obstructions in the Spleen and neighbouring Parts. The faculty of the Spleen was weaken'd, so that not able to do its Office in Chymification, and breeding Matter unfit for convenient Fermentation of the Humors, it left many feculent, acid, sour, thick and crude Humors, which not able to pass the small Vessels, got together in a large quantity in the left *Hypochondrium* about the Spleen, which occasioned that troublesom Ponderosity; accompanied with wind and roarings; for that while Nature endeavours the Concoction of that acid Matter, which she cannot well accomplish, those acid Humors receive some Fermentation, which begets that great quantity of Wind, which not finding an easie Exit, occasions those rumblings, and distensions of the Parts. This thicker, acid and sharp Matter being carried to the Heart, causes Palpitation, while the Heart endeavours to expel that sharp pricking Matter from it. And in regard that Melancholly Juice is not equally troublesom to all the Parts of the Heart; thence it happens that the Palpitation does not always continue, but comes by intervals. The same Juice being expelled from the right Ventricle of the Heart to the Lungs, when it comes to fill the small branches of the Arterious Veins, and Veiny Artery, as not being able to pass them without great difficulty, fills the Breast with many Vapors, and causes difficulty of Respiration. But being carried through the Arteries with the Vital blood to the Brain, it disorders the Motion of the Animal Spirits, renders them more impure, and alters them by a Specific and bad mistemper. Thence those Melancholly Imaginations, by which the Operations of the Mind and Ratiocination are disturbed, which occasions a Delirium accompanyed with fear and sadness.

IV. But because that Melancholly humor is not generated at first in the Head, but ascends from the *Hypochondriums*, especially the left, to the Head; hence this Melancholy is not particular to any Part, but Sympathetic, and therefore from the Name of the Place, where the Nourishment of the Distemper lyes, is called *Hypochondriac*.

V. This Melancholly Delirium is hard to be cured, and not void of danger. 1. Because the Causes of it are mischievous and remote, in regard they occasion the Generation and Accumulation of that feculent Melancholly Matter in the *Hypochondriums*. 2. Because that feculent Matter is obstinate and not easily tam'd by Medicaments, and infects the Animal Spirits with a peculiar evil Temper. 3. Because the Cure requiring a longer time, the question is, whether the Patient will take so much Physic or no. 4. Because the continued ascent of the Melancholly humor to the Brain, the Distemper instead of being Sympathetic, may turn to be the peculiar Passion of that Part. 5. Because those Melancholly Humors are troublesom to the Membranes of the

the Brain and Nerves, through their occult and manifeſt Qualities, their acrimony and ſourneſs, &c. whence the fear is, leaſt their copious afflux to the Brain ſhould cauſe Convulſions, Epilepſes, &c.

6. Becauſe this Delirium is not accompanied with Laughter, but with a ſad and ſerious Muſing. Yet while there is ſtrength and a willingneſs to take Phyſic, there is ſome hopes of Cure.

VI. In the Method of Cure, the containing Cauſe is firſt to be diſcuſſed, and the ill temper of the Animal Spirit to be removed as alſo that the Antecedent Cauſe, or Melancholly Humor in the *Hypocondriums*, be atteuated, digeſted and evacuated, and a new Generation and Accumulation of it prevented, that Obſtructions be removed, and that the Brain, Spleen and other Bowels be corroborated.

VII. Milder Medicaments, not very hot will be moſt convenient; leaſt the Matter being agitated by ſtronger and very hot Medicines be carried in too great a quantity to the Heart and Brain.

VIII. Firſt looſen the Belly with this Glyſter.

℞. *Emollient Decoction* ℥ x. *choice* Hiera Picra, Diacatholicon *an.* ℥ j. ſ. *Oyl of Camomile* ℥ j. ſ. *Salt* ʒ j. *mix them for a Glyſter.*

The next day but one, or the third day, give him this Purge.

℞. *Leaves of Senna* ℥ ſ. *white Agaric, Aniſe-ſeed, an.* ʒ j. *Ginger* ℈ j. *Decoction of Barly* q. ſ. *make an Infuſion, then add to the ſtraining Confect. Hamech* ʒ ij. Hiera Picra ʒ j. *For a Potion.*

IX. Now becauſe People thus affected have their Veins ſwelled, with a Palpitation of the Heart ſometimes, and that their ſtrength is in good Condition after Purging, Blood-letting will not be amiſs in the Arm; or if the Hemorhoid Veins appear, Leeches may be properly applied.

X. This done let the Patient drink three or four times a day, a draught of this Apozem.

℞. *Root of Polipody of the Oak* ℥ j. *Eringos, Cammoch, Rind of the Roots of Capers, Tamariſch, an* ℥ ſ. *Herbs, Borage, Roman-Wormwood, Strawberry-leaves, all the Dandelions, Ceterach, Germander, water Trefoile an.* M. j. March *Violet-leaves and Baum an.* M. ſ. *Citron and Orange-Peels an.* ℥ ſ. *Damask Prunes* vij. *Currants* ℥ ij. *Steel ty'd in a little knot* ℥ j. *Aniſe-ſeed* ʒ iij. *common Water* q. ſ. *Make an Apozem. of* ℔ j. ſ.

XI. After he has uſed this Apozem four days, let him take the Purge aforeſaid again, and then return to his Apozem; and ſo continue this method for ſome time, and if he be bound while he takes his Gliſter, let him be looſened with the foregoing Gliſter; now and then the Apozem may be made Purging by adding.

℞. *Leaves of Senna* ℥ ij. *Root of black-Hellebore* ʒ ij. *Indian Mirobalans* ʒ vj. *Aniſe-ſeed* ℥ ſ. *and let him drink* ℥ iiij. *every Morning.*

If he find himſelf nauſeous and inclining to Vomit, this Vomitory may be given him.

℞. *Conſerve of Leaves of Aſarabacca* ʒ x. *Decoction of Radiſhes* ℥ iij. *Oxymel Scyllitic with Agric* ℥ ſ. *Vomitious Wine* ʒ iij.

XII. In the mean time that he takes theſe things, let him alſo for the ſtrengthening of his Head and Bowels, take of theſe Tablets ſeveral times in the Day.

℞. *Specier. Diambræ* ʒ j. *Dianthos, Aromatic. Roſatum, an.* ℈ j. *Powder of the Yellow of Citron-rind* ℈ j. ſ. *Sugar diſſolved in Betony-water* ℥ ij. *For Tablets.*

Or let him ſometimes take a ſmall quantity of this Conditement.

℞. *Specier. Diambræ* ʒ j. *Conſerve of Borage, Baum, Roſemary-flowers, pale Roſes an.* ʒ iij. *Syrup of Citron rind,* q. ſ.

XIII. Let him keep in a good and pleaſant Air, and avoid Loanlineſs; converſe with merry Company, and be merry himſelf. Let him abſtain from all Meats of hard Digeſtion and ill Nouriſhment, eſpecially ſalted and ſmoaked food. Let him avoid bottled and windy Drink, and let his Salads and Sauces be ſuch as attenuate and open, and promote Concoction, but not very hot.

HISTORY. V.

Of Madneſs.

A Young Gentlewoman about twenty eight Years of Age, luſty, perſpicacious, melancholy, muſing and thoughtful, but uſing an ill Diet, and ſometimes liable to obſtructions in her *Hypochondriums*; finding her ſelf to be ſlighted by her Parents, a long time concealed her greif, and publickly ſhewed her ſelf chearful, but ſpent the Nights without ſleep, in Moroſneſs, Tears and Sighs. At length ſhe was taken with a pain in her Head, accompany'd with a ſlight Fever, diſorderly but continual: within a few days her pain leaving her ſhe appeared to be light Headed, for ſhe that was before reſerved of her Speech, grew to be very talkative of a ſuddain; ſo that at length ſhe began to talk not only all day but all night long. However for the firſt two or three days, though ſhe talked much yet what ſhe ſaid was all ſence and rational enough; but after that ſhe fell to raving and non-ſence; then her Fever ceaſed; but ſtill ſhe never ſlept; this *Delirium* within a few days increaſed to that degree, that ſhe grew ſullen, angry, run about the Chamber, made a noiſe, and grew ſo out-ragious, that ſhe laid violent hands upon all that came near her, talked obſcenely, and tore her Cloaths: ſo that ſhe was forced to be held down in her Bed, nevertheleſs ſhe was ſtrong, had her Evacuations duly, and an indifferent good Stomach, nor was ſhe very thirſty; neither was ſhe much ſenſible of the bitter Cold, Froſty, Winter Seaſon, though ſhe had hardly any Cloaths upon her; but was always warm.

I. THAT the Brain of this Woman was terribly affected, appears by her continued Madneſs, accompanied with want of ſleep, boldneſs, immodeſty and anger, and that her Heart and the reſt of her Body ſuffered, was plain from her extraordinary heat.

II. This Delirium is called Madneſs, and *is a continued Commotion of the Mind with an enraged Boldneſs, ariſing from the heat of the Spirits.*

III. The chiefeſt of all the evident Cauſes, was her grief to be ſo ſlighted by her Parents, which though ſhe diſſemblingly ſuppreſſed at firſt, nevertheleſs in a young Perſon, Melancholy of her ſelf, and by reaſon of her diſorderly Diet, abounding with Choleric and Melancholy humors, and ſo liable to Diſeaſes, it might eaſily produce a raging Delirium. For that ſlight, ſometimes moved her to Anger, while the Choler boiled that was mixed with her Melancholly humors, ſometimes to ſadneſs, the Melancholly humors being moved, and overcoming the Choleric, and through that diſorderly ſtriſe and Effervеſcency of the Choler with the Melancholy, the whole Maſs of Blood boiled, which occaſioned a ſlight Putrefaction, which begot a ſlight diſorderly Fever accompanied with the Head-ach, cauſed by the ſharp Choloric and Melancholy Vapors, carried up together to the Head. But at length that effervеſcency of Choler and Blood, being vanquiſhed by the abundance and quality of the Melancholy Humor, the Fever went off; and the Animal Spirits were heated alſo, by the hot Melancholy humors, predominant in the Body and the Head, and ſet a boiling by the foregoing effervеſcency of the Choler; and were ſo rapidly and diſorderly moved, that they cauſed a Delirium, firſt more gentle, while the Spirits were not ſo much heated and agitated; then violent with Anger, Immodeſty and Rage, by reaſon the ſharp heat of the Animal Spirits was augmented; ſo that being now too much attenuated, and become more eager, they are more rapidly moved, and more diſorderly and violently agitated.

IV. Now becauſe not only the Animal, but the Vital, Spirits are poſſeſſed with

with that heat, as alſo the whole Maſs of the Blood, hence it comes to paſs that the whole Body becomes ſo heated, that they are not cool'd by the Cold of the External Air, but always remains hot.

V. Yet there is no Fever, becauſe that violent fervor of the Blood and Spirits, though it be great and ſharp, yet there is neither Putrefaction nor Inflammation, becauſe it conſiſts more in Salt then Sulphury Particles.

VI. This Malady is difficult to Cure, partly, becauſe the moſt noble Bowels are affected; partly becauſe the Cauſe lyes in a depraved, obſtinate and copious Humor. Laſtly, becauſe the Patient being Mad, will not be rul'd, nor ſuffer the adminiſtration of proper Medicines. However the longer it is delay'd, the more difficult the Cure will be.

VII. The primary Indications relating to the Cure are theſe. 1. To prepare and evacuate the Melancholly humor abounding in the Body, and to extinguiſh the heat both of that, as of the Blood and Spirits. 2. To prevent the new generation of the ſame Humor and Fervor. 3. To coroborate the Bowels, eſpecially the Heart, Brain, Liver and Spleen. And this is to be done by Diet, Chyrurgery and Pharmacy.

VIII. The Chamber wherein the Patient lyes muſt be gloomy, where he or ſhe muſt be kept by ſtrong Men or Women; or elſe their Arms muſt be bound with broad Swaths, that they may do no harm to themſelves nor others. They are to be viſited by very few, whoſe Company they loved in the time of Health. They muſt be kept in a temperate Air. Their Diet muſt be moiſtning and moderately cooling, rather moiſt then dry. Their Drink, Ptiſans or ſmall Ale. They muſt be kept quiet with good words, and provoked to ſleep as much as may be, and all Evacuations of Nature in both Sexes, muſt proceed naturally; while Art ſupplys the diſorders of Nature.

IX. Though the enraged Patient refuſes all Medicaments, yet fair words muſt be try'd, and this draught obtruded inſtead of Drink.

℞. *Leaves of Senna* ℥ ſ. *Aniſe-ſeed* ʒ j. *Decoction of Barly* q. ſ. *infuſe them according to Art: then to the ſtraining add Confect. Hamech* ʒ iij. *Extract of Hellebore* ϑ j. *Mix them for a draught.*

X. After Purgation Blood-letting is requiſite, not once but often in the Hands, Feet, Forehead, Arms, and other convenient Places, and a good quantity of Blood to be taken away, according to the ſtrength of the Patient. And the Patient is to be well guarded from looſening the bindings of the Fillets after ſtopping the Blood.

XI. Between every Blood-letting, Purge the Patient then with a draught before mentioned, or Powder of *Dia-Senna*, or *Confect. Hamech* alone. Or if theſe be refuſed, make uſe of Codiniac, or Rob of red Currants, to every Ounce of which, add grains twenty four; and of this mixture give ſix or ſeven drams, as you find it works. Or if the Party love Currants, boil them in the Decoction of Senna-leaves, or Roots of black Hellebore, till they grow plump, then take them out and let them dry, in a place expoſed to the Wind, that they may not ſeem to have been boiled, and give them to eat.

XII. You may try either by fair words or by fraud, to make her drink now and then in a day, a draught of this Apozem.

℞. *Roots of Polypody of the Oak, Succory an.* ℥ j. *Rind of Caper-roots, Tamariſch. an.* ℥ ſ. *Herbs, Dodder, Venus-hair, Lettice, Dandelion with the whole, Sorrel, Ceterach, Borage, Bugloſs an.* M. j. *Cordial Flowers an. one little handful, Citron and Orange Peels an.* ʒ iij, *Fruit of Tamarinds* ℥ j. *Common-water* q. ſ. *Boil them for an. Apozem of* ℔ j. ſ.

If you ſteep in this Apozem,

Leaves of Senna ℥ j. ſ. *Root of Black Hellebore* ʒ ij. *Aniſe-ſeed* ʒ ij.

By that means it will become a Purging Apozem, which if the Patient likes may be often adminiſtered.

XIII. Let this Conditement be alſo offered upon occaſion.

℞. *Conſerve of Violets, Pale Roſes, Rob of Red Currants, Candied Citron-peel an.* ʒ iij. *Pulp of Tamarinds* ʒ vj. *Syrup of Violets* q. ſ.

XIV. Becauſe ſuch a Patient chiefly requires ſleep; toward Evening give an Amygdalate, wherein put an Ounce of Syrup of Popies, or a little more, or three grains of *Opiate Laudanum*; but this not above once or twice in a Week, or

or one or two Heads in the boiling the aforesaid Apozem, or by adding to the aforesaid Conditement one or two drams of *Nicholas's Rest*: or by anointing the Temples and Forehead with Oyl of Popies or *Populeon* Oyntment.

But give not these Soporifics too often, too long, nor too strong.

XV. In the mean time, the Hair being shaved off, let the Head be fomented for an hour or two in the Morning, with this Fomentation luke-warm.

℞. *Herbs, Betony, Vervain, Marjoram, Plantain an.* M j. *Lettice* M iiij. *Flowers of Roses, Melilot, Dill, Camomil, an.* M j. *Hemp and Coriander-seed an.* ℥ ſ. *Common-water* q. ſ.

After Fomentation keep the Head well covered from the cold Air. But this Fomentation will not be proper before the Body be well purged, and some Blood be taken away.

XVI. When the Distemper begins to aſſwage, it will not be amiss to clap alive Hen cut in two upon the Head, or the Lungs of a new kill'd Sheep or Calf newly killed.

XVII. Some applaud the clapping of Medicines to the Feet, as also Pidgeons slit, or Tenches slit, or else Leaves of Coleworts and Rue, with Sowre Ferment Salt and Vinegar, and so bruised into the form of a Past, and bound to the Soles of their Feet, which if they do no good, yet do no harm, and therefore in this case may safely be made use of; for the satisfaction of such as desire it.

HISTORY. VI.

Of the Disease call'd Coma, both Somnulent and Wakeful.

A Person about forty Years of Age, somewhat of a Phlegmatic Constitution, was wont to be troubl'd twice or thrice a Year with Catarrhs falling upon his Teeth or Lungs, which sometimes seized him with a slight Pain in his Head, sometimes without any at all; at length in *Autumn*, he felt a distensive and heavy pain in the hinder part of his Head, such as used to precede his Catarrh, but then no Catarrh ensued; however this pain increasing and being accompany'd with a giddiness, after Purgation and Bloodletting by the advice of a Physitian, and other proper Remedies applied, the Pain abated, so that the Patient went abroad again; but venturing too soon into the cold Air, when he found the Pain together with the giddiness encrease again, he was forced to take his Bed, and of a suddain was perceived to rave. The Pain still more and more augmenting, the second day, standing by his Bed side, he fell down, not being able to rise, but by those in the Room was put to Bed again, where in a short time he fell into such a deep sleep, that nothing but violent pulling and pinching him would wake him, and then he only opened his Eyes a little, but spoke nothing, and fell asleep again. The third day there was no rowsing him; but when this profound sleep had continued about four days he began to wake, however then he spoke but little, and that after a wild and raving manner; thus he lived eight days. Afterwards he had a continual Inclination to sleep, with his Eyes winking, but could not sleep, and muttered many things idly to himself; sometimes lying still, when he was thought to be asleep, of a suddain he would endeavour to leap out of his Bed and to do something or other; but was so weak that he could not. In this inclination to sleep with a continued Delirium he remained eight or ten days; afterwards he could not sleep at all, neither had he any Inclination to sleep for a Fortnight together; in the mean time the *Delirium* abated every day; so that within that time, he became sound of his Mind and recovering his strength

ſtrength was reſtored by his Phyſitians to his former Health, during the whole courſe of his Diſtemper he had no Fever. His Appetite was good even in his profound ſleep; for though when he waked he asked for nothing, yet he took whatever was given him and digeſted it well. By his wild Anſwers it appear'd, that not only Imagination and Reaſon, but his Memory was weakned. The Queſtion is, what ſort of Diſeaſe this Man was troubled with, and with what Remedies it was to be cur'd?

I. THat the Brain of this Perſon was affected, and thence his Principal and External Senſes were alſo troubled, is plain by the Relation.

II. That profound ſleep, which at firſt oppreſſed him was a *Somnulent Coma, which is a deep ſleep ariſing from the benumedneſs of the common Senſe.* But that heavy inclination to ſleep, which followed after, yet with an inability to ſleep, was a *Wakeful Coma, which is a heavy propenſity to ſleep, with an impotency ſo to do, by reaſon of the Obſtruction or Compreſſion of the Veſſels in the Ventricles of the Brain, and a diſorderly motion of the Spirits diſturbing the Mind.*

III. The Antecedent cauſe of this Malady was a Copious Generation of Flegm in the lower Parts; which being carried to the Brain, and collected in the Ventricles of it, conſtitutes the containing Cauſe. For that ſame Flegm not being able to fall down to the lower Parts, as is uſual, but being there detained, with its quantity diſtends the Veſſels; whence firſt a diſtending and oppreſſive Pain; afterward that Flegm being more encreaſed, in ſome manner compreſſed the Choroid-fold, together with the wonderful Net, hence the Vital Spirits not ſufficing to ſupply the want of Animal Spirits to perform the Offices of the principal and external Senſes, the Patient, motion ceaſing, fell down, not being able to riſe again; and then the external Senſes ceaſing, a deep ſleep enſued. At length by the help of Nature and Medicines that obſtruction of the Choroid-fold being ſomewhat open'd, and the Vital Spirits let looſe to encreaſe the Animal, which were not yet plentiful enough, beſides that they moved diſorderly through obſtructed paſſages, hence the mind became diſturbed; for that though more Spirits then before flowed forth to the Organs of the Senſes, yet they were not ſufficient to perform the whole duty; which cauſed that great inclination to ſleep; which however was ſtill diſturbed by the continual diſturbance of the Mind; ſo that though the Patient were willing to ſleep he could not, but as it were wak'd ſleeping, with continual Deliriums. Laſtly the Obſtruction being wholly opened, and the Spirits having gain'd free Paſſage, yet very few Vapors aſcending to the Brain by reaſon of the extream Emptineſs of the Body, to ſtay them their due time in the Brain, hence followed continual Watchings, which abated as more Vapors aſcended to the Brain upon Digeſtion of more Nouriſhment. There was no Fever, becauſe no Putrefaction of Humors moleſted the Heart.

IV. A Somnulent or waking *Coma*, is a moſt dangerous Diſeaſe, which kills many, eſpecially if the profound ſleep extend it ſelf beyond the fourth day: in regard the moſt noble Bowel the Brain is moſt grievouſly affected. For that Obſtruction and Compreſſion endangers the Choroid-fold for two Reaſons: either becauſe the *Coma* for want of Animal Spirits may turn to an Apoplexy; or becauſe the hot Vital Spirits, not being able to get through their wonted paſſages, may cauſe an Inflammation in the Membranes of the Brain, and then a Phrenſie would enſue.

V. The principal Curative Indications are to draw back and evacuate the containing Matter at the beginning, and ſo to open the Obſtruction; then to take away the Antecedent Cauſe; and hinder a new collection of Flegm.

VI. Becauſe a Man in that profound ſleep can ſwallow nothing. Glyſters muſt be adminiſtred at leaſt once a day. Hard Frictions and Dolorific Ligatures of the extream Parts muſt be made uſe of: Blood muſt be taken from the Arm. Cupping-glaſſes both without and with Scarification, muſt be applied to the Shoulders, Back and Neck. The Patient alſo muſt often be waked with jogging and pinching, if it be poſſible; and that the containing Matter may be

ſhaken off and expelled, this Sternutory is to be blown up into the Noſtrils, ever now and then:

℞. *Root of white Hellebore*, ℈j. *Pellitory*, ℈ ſ. *Leaves of Marjoram*, ℈j. *Pepper*, *Caſtoreum*, *an.* gr. v. *For a Powder.*

VII. His ſleep abating; give him theſe Pills.

℞. *Maſs of Pill Cochiæ*, ℈j. *Extract of Catholicum*, ℈ ſ. *For five Pills.*

Or if he cannot ſwallow them, give him one dram of Powder of *Diaturbith*, or *Diacarthamum* in a little ſmall Ale. Or a Purging draught, prepared with Leaves of Senna, Agaric and Jallop-Roots or the like.

VIII. The Body being ſufficiently Purged, this Apozem, or ſuch like may be preſcribed.

℞. *Root of Acorus*, ʒvj. *of Elecampane, Fennel, an.* ʒſ. *of Galangal*, ʒij. *Herbs, Marjoram, Roſemary, Betony, Baum, Calaminth, an.* M. j. *Sage, Flowers of Stœchas, an.* M. ſ. *Juniper-Berries*, ʒvj. *of Lawrel*, ʒij. *cleanſed Raiſins*, ʒij. *Water*, q. ſ. *Boil them, and make an Apozem of* ℔. j. ſ. *to which may be added Syrup of Stœchas*, ʒij. *or* iij.

Let him drink of this Decoction, three or four times a day. In the mean time let him continue the uſe of his Sternutory.

IX. If he cannot take his Apozem, let him now and then take a Quantity of this Conditement.

℞. *Specier. Diambræ* ʒ j. ſ. *Conſerve of Baum, Flowers of Sage, Betony, Roſemary, an.* ʒ ſ. *Syrup of Stœchas* q. ſ. *For a Conditement.*

X. Alſo let the following Quilt be laid upon his Head.

℞. *Leaves of Marjoram, Roſemary, Flowers of Lavender, Melilot, an.* ℈iiij. *Benjamin, Nutmeg, Cloves, an.* ℈j. *To be groſly powdered for a Quilt.*

Then anoint his Temples and the top of his Head with this Liniment;

R. Oyls of Roſemary, Marjoram, Nutmegs, an. ℈j. *Martiate Oyntment* ʒij.

And let him wear this a good while after the Cure.

XI. Let his Diet be ſparing, Meats of good Juice, and eaſie of Digeſtion, ſeaſoned with Roſemary, Marjoram, and other Cephalics. When he wakes continually Amygdalates are proper: for they yield good Nouriſhments and provoke ſleep: and all natural Evacuations muſt duly proceed.

HISTORY VII.

Of the Lethargy.

A Perſon, threeſcore Years of Age, of a Flegmatic Conſtitution, having all the *Autumn* being careleſs of his Diet, feeding greedily upon Fruit, Lettice, Cowcumbers, Melons and ſuch like, for ſome days perceived a wearineſs of his whole Body, with a great Inclination to ſleep. Then he was taken with a ſlight continued Fever, which toward Night growing worſe, ſeemed like a Quotidian. This Fever was preſently accompany'd with a very great drowſineſs, ſo that he could not be kept from ſleeping and which was ſo profound, that he heard not the ſtanders by, though they bawled out and made never ſo loud a noiſe; being at length rowſed out of his ſleep not without great difficulty and hawling and pulling, he looked upon the ſtanders-by, but anſwered very little to their queſtions; and that, very little to the purpoſe; not knowing that he had been aſleep: if they gave him a Chamber-Pot; he forgot to make water; and ſo with

with his Mouth and his Eyes ſhut he fell aſleep again; his Pulſe was ſtrong, but ſlow and at diſtant intervals; and toward Night unequal and ſomewhat ſwifter, his Urine was muddy, with a very thick Flegmatic Sediment.

I. THat the Head and whole Body of this Patient were affected, appears from the profound Sleep, which oppreſſed the one, and the continued Fever and laſſitude that ſeized the other.

II. That heavy drowſineſs which ſeiz'd our Patient, is called a Lethargy, which is *an inſatiable Propenſity to ſleep with a gentle Fever and moleſtation of the Principal faculties.*

III. The remote Cauſe of this Malady was cooling and bad Dyet, which generating a great quantity of Flegmatic humors in a Flegmatic Body, made the antecedent Cauſe.

IV. Which Flegmatic humors being carried in great quantity to the Brain, and affecting it with a cold miſtemper; partly putrifying in the larger Veſſels, and inflam'd in the Heart, and thence diſpeirſed through the whole Body, and through the Carotides Arteries to the Brain, conſtitute the containing Cauſe of the Sleep and Fever.

V. For when thoſe crude Humors already inflam'd in the Heart come through the Carotides Arteries to the *choroid*-Fold, whoſe ſmall Arteries by reaſon of the cold temper of the Brain, (are narrower then uſually,) and partly through their own thickneſs, partly through the narrowneſs of thoſe paſſages ſlowly paſs through the Choroid Fold, they are there thickened ſtill more and more, by the cold Conſtitution of the Brain, and their Paſſage becomes more obſtructed; ſo that for that reaſon the Animal Spirits growing fewer, and but ill ſupplyed, and conſequently not ſufficing to officiate in their dutys, hence follows a Ceſſation in the Organs of thoſe Senſes: by which means when no objects can be carry'd to the Principal Senſes they ceaſe too, when a profound Drowſineſs out of which when the Patient is rouſed, the Principal Senſes appear damnified, for want of Spirits, and their diſorderly motion through obſtructed Paſſages.

VI. This Diſeaſe is dangerous. 1. Becauſe the Brain is dangerouſly affected. 2. By reaſon of the Fever which affects the whole Body. 3. Becauſe the Patient was old, and unable to conquer ſuch a Malady for want of Natural heat and ſtrength; but becauſe he had ſome ſtrength remaining, there was hopes of Cure.

VII. In the Cure, the Flegmatic Matter abounding in the whole Body is to be Evacuated, drawn back from the Head, and deriv'd to the lower Parts. The Cold Diſtemper of the Head to be remov'd, the Head to be corroborated, and the Matter therein contain'd to be diſſolv'd and drawn away.

VIII. After a Glyſter, Dolorific Ligatures, and hard Frictions of the Thighs are very proper, if frequently uſed. Blood-letting at ſuch an Age is not ſo convenient; therefore Cupping-glaſſes both with and without Scarification are to be apply'd to the Shoulders, Neck and Back. But no repelling Cold Medicines are to be uſed in this Caſe.

IX. So ſoon as the Patient can be wak'd let him have this Apozem given him.

℞. *White Agaric*, ʒj. *Leaves of Senna*, ʒ ſ. *Aniſe-ſeed*, ʒj. *Ginger*, ℈j. *Decoctions of Barley*, q. ſ. *Infuſe them, then add to the ſtraining Ele. Diaphenicon* ʒiij.

If the Body be bound it muſt be looſen'd with Glyſters.

X. The Body being well Purg'd, let him take every foot a draught of this Apozem.

℞. *Roots of Aromatic Reed, Elecampane, Fennel, Stone-Parſly, an.* ʒſ. *Herbs, Betony, Venus Hair, Century Leſſer, Dandelion, an.* M. j. *Roſemary, Marjoram, Hyſſop, Flowers of Stœchas, Camomil, an.* M. ſ. *Juniper-Berries*, ʒvj. *Aniſe-ſeeds*, ℈j. ſ. *Citron and Orange-Peels, an.* ʒſ. *Water* q. ſ. *Make an Apozem of* ℔j. ſ. *To which add Syrup of Stœchas* ʒij. *or* iij.

XI. After he has taken this Apozem, let him Purge as before or if he like Pills better, let him take ℈ij or iij of *Cochia* Pills, or ʒj. of *Diaturbith* or *Diacarthamum* powder'd and diſſolv'd in Barley-water.

XII. After this ſecond Purgation, let him return to his Apozem, to which you may then add ſeveral Diu-

retics as Roots of Dodder, Asparagus, Eryngos; and Herbs as Stone Parsley, Strawberry Leaves and the like. Castoreum also may be properly mix'd in this Apozem; or else five or six grains given him in a little Oxymel of Squills.

XIII. While these things are a doing let the Matter be specially Evacuated out of his Head; the Head be Corroborated with Topics, and the remaining Matter there discuss'd. Evacuation is performed by Errhins of equal Parts of Roots of Beets and Leaves of Marjoram: and by Snuf blowing into his Nostrils the following Sternutory.

℞. *Root of white Hellebore* ℈j. *of Pellitory, and Leaves of Marjoram, an.* ℈ ſ. *Black Pepper,* gr. v. *Castoreum, Benjamin, an.* gr. iiij.

To corroborate the Brain anoint the top of the Head and Temples with this Liniment: and then cover the Head with the following Quilt.

℞. *Oyls of Amber, Rosemary, Marjoram, an.* ℈ij. *Martiate Oyntment,* ℥ij. *Castoreum, Powdered,* ℈ ſ. *For a Liniment.*

℞. *Leaves of Marjoram,* M. j. *of Rosemary, Sage, and Flowers of Melilot, an. one little handful, Cloves, Nutmegs, an.* ℈j. *Castoreum,* ℈ ſ. *Beat these into a gross Powder for a Quilt.*

XIV. Let him have a good Air, a light Room, moderately warm, and Perfumed with Castor, Peny-royal, Rosemary, Sage, Thime, Marjoram, Baum, *&c.* let his Food be easie of Digestion, Condited with Rosemary, Betony, Marjoram, Hyssop and the like. Let him avoid Milk, Pulse and Fruit, Garlic, Onions, Mustard, Radishes, *&c.*

Let his Drink be Barley-water, with Majoram, Hyssop, Rosemary and the like boil'd in it, sweetened with a little Hydromel or Honey, and aromatiz'd with Saffron. Let him sleep as little as may be: and make his natural Evacuations come forth in due order.

HISTORY. VIII.

Of the Profound Sleep call'd Carus.

A Stout young Man having fallen from a high Place upon his Head, was seized with a deep sleep; being put by his Friends, who thought him drunk, into his Bed; he continued so for two days. There was no Wound appeared in his Head, which was defended by a good strong Cap; only in the top of his Head there was a Contusion, not very big; his Pulse beat well; nor did he shew any Signs that his Heart was affected; he breathed freely: If he were prickt, he shrunk up the prickt Member; In the mean time no noise, nor pulling him by the Hair nor other means would wake him.

I. How far this Patients Head was affected, the profound sleep sufficiently shew'd.

II. This sleep is called *Carus*, which is a profound sleep, with an injury to the Animal Actions.

III. 'Tis no Apoplexy because the Person breaths freely; nor Lethargy, because there is no Fever: and the Patient cannot be waked; wherein it differs from *Coma* since the Patients in that Distemper are often waked, and move their Limbs from one place to another.

IV. The cause of this is a depression of the upper Skull, and the Bones of the *Bregma*, caused by the Fall, by which the Brain being depressed the Brain is hindered in its Motion, which injures all the Animal Actions. Besides that the *Choroid*-fold being obstructed by the Compression, hinders the Passage of the Vital Spirits to the Brain, and consequently the Generation of Animal, to supply the wast of Spirits in the Organs of the Senses; into which the Animal Spirits having not a free Influx by reason of that Compression, the actions of the Parts fail, and thence that deep sleep.

V. This *Carus* is very dangerous, and threatens an Apoplexy, if not taken care of in time.

VI. The Cure consists, in raising the depressed

depreſſed Skull. 2. In corroborating the wakened Brain. 3. In taken care of the whole Body to prevent the flux of many Humors to the Head; or any other Diſeaſe from breeding at that time in the Body.

VII. Therefore a Gliſter given, take eight or nine Ounces of Blood out of the Arm. Then proceed to Denudation, and if need require, Perforation of the Brain.

VIII. The ſame day the Gliſter is given, and the Vein opened toward the Skull, in the place where the Contuſion appears, muſt be laid bare with a Croſs-like Inciſion made in the fleſhy Parts. The next Morning raiſe the Bone with proper Inſtruments. But for fear leaſt by that violent Contuſion, ſome little Veins ſhould be broken in the hard Meninx, which may have poured forth any Blood between the *Meninx* and the *Cranium*, which corrupting there, ſhould afrerward be the Cauſe of unexpected death, the ſafeſt way would be to Perforate the Skull in the firm Part next the depreſſed Part; to give the extravaſated Blood an eaſie Exit, and for the more eaſie raiſing of the depreſſed Skull.

IX. The Skull being raiſed and the wound ſtopt according to Art, let this Fomentation be clapt warm about his Head, ſtill ſhifting it as it grows cold.

℞. *Betony* M. iiij. *Marjoram, Roſemary, Vervain, Fennel, Leaves of Lawrel, Baum, Thime, Rue, Flowers of Stœchas, Camomil, Melilot, an.* M. j. *Common Water* q. ſ. *boil them according to Art, adding toward the end White-wine* ℔ j. *Make a Fomentation of* ℔ iij.

X. Anoint his Fore-head with this Liniment.

℞. *Oyls of Amber, Roſemary, Marjoram diſtilled an.* ℈ j. *Caſtoreum pulveriſed* gr. ix. *Martiate Unguent* ʒ ij.

XI. The Patient being rous'd from his ſleep, which uſes to happen, after the raiſing of his Skull, give him this Purging draught.

℞. *Leaves of Senna* ʒ iij. *Rubarb* ʒ j. ſ. *white Agaric* ʒ ſ. *Aniſe-ſeed* ʒ j. *Decoction of Barley* q. ſ. *Infuſe them: then add to the ſtraining, Elect. Diaprunum ſolutive* ʒ iij.

XII. The Body being Purged, let him drink twice or thrice a day a draught of this Apozem.

℞. *Succory Root* ʒ j. ſ. *of Fennel and Acorus an.* ʒ ſ. *Herbs, Betony, Dandelion, Borage, Baum, Rue, an.* M. j. *Roſemary, Marjoram, Flowers of Stœchas an.* M. j. *Orange and Citron Peels an.* ʒ ſ. *Currants* ʒ ij. *Water* q. ſ. *For an Apozem of* ℔ j. ſ.

XIII. Inſtead of the Apozem, he may now and then take a ſmall quantity of this or ſuch like Conditement.

℞. *Specier. Diambræ* ʒ j. *Roots of Acorus Condited, Candied Orange-peels, Conſerve of Anthos and pale Roſes an.* ʒ ſ. *Syrup of Stœchas* q. ſ.

XIV. If he be bound at any time in his Body, let him be looſened with Gliſters. Or elſe take the following Mixture, and hang it up in a little Bag, in a Pint and a half of ſmall Ale, and give him a draught or two every Morning.

℞. *Leaves of Senna* ʒ j. ſ. *Rubarb* ʒ ij. *Root of Jallop* ʒ j. *Aniſe.* ʒ ij. *Leaves of Marjoram, Carduus Benedict. an.* M. ſ.

XV. Keep him in a good temperate clear Air: let his Meats be of eaſie Digeſtion; and ſparing at firſt. His Drink ſmall; his Exerciſes moderate: little Sleep at firſt eſpecially. But let his natural Evacuations duly proceed, either ſpontaneouſly or provoked by Art.

HISTORY IX.

Of a Catalepſis.

A Young Maid, her Evacuations being obſtructed, and frequently liable to Uterine Suffocations, being taken of a ſuddain, remained void of Sence, and in that Poſture as ſhe taken waxed cold, keeping her Eyes open and fixed but ſeeing nothing; if the ſtanders-by moved her Arm upwards or downward or ſide-ways, it remained

as

as they laid it; if they set her upon her Feet she stood; if they moved her Body forwards, she put out her Foot, if they turned her Head on one side, so it stood all this while she breathed freely; when this fit had lasted an hour, she came to her self, but remembered nothing of what had happened. Two days after she was taken with another Fit, which went off of it self.

I. THat the Seat of this Distemper was in the Head, the terrible Molestation of the Animal Actions declare; as the Uterine Suffocation shewed the Distemper of the Womb.

II. This Affection is called a Catalepsis, and is a sudden, and very great Molestation of the Animal Actions, with a cold Rhumineſs of the whole Body; in which Distemper the Patient keeps that Posture of Body wherein they were when first taken.

III. The Brain of this Woman was affected, not the whole, but in that Part where the common Sense lies, and that by a vitious Humor or Vapor, translated thither from the Womb.

IV. The *Antecedent Cause*, is a vitious and viscous Humor, or thick Vapor, generated or collected in the Womb, and thence conveighed to the Head through blind Channels, which adhering to the common Sensory, and Parts adjoyning, and involving them of a sudden, hinders the determination of the Spirits from the common Sensory, and so constitutes the *containing Cause* of this *Catalepsis*.

V. Now because the whole Brain is not affected, but that sufficient Spirits are generated therein, whose Influx into the Nerves is not hindred by any Compression or Obstruction of the beginning of the Nerves, hence it comes to pass, that those Spirits flowing into the Parts designed, when the common Sensory is already possessed of a sudden by that vitious Humor, or thick Vapor, are not determined to other Parts, but copiously flow to those Parts to which they were determined, just before the *Catalepsis*. Which is the reason that the several Parts remain in that Posture, wherein they were before the Fit, and that the Eyes, Arms and Thighs remain as it were fixed.

VI. Now the reason why the Patient stands, being set upon her Legs, and why her Members being moved this way or that, remain in the same Situation, is this, because the Situation of the Muscles being changed, the Influx of the Spirits is also changed, and the Pores before open, through which the Spirits flowed, are shut; but others which were shut before, are opened; so that the Spirits which copiously flowed before into these, the Situation being altered, flows into those Muscles, into which they still also flow, till the Situation be altered.

VII. Respiration is performed after the same manner as in those that sleep, and remains unhurt; partly, because of the remarkable largeness and broadness of the Pores, and the mainly necessary use of the Respiratory Nerves; partly, because of the Customary and continual Determination to the Respiratory Nerves.

VIII. The Fit ceases upon the discussing or dissipation of that Humor or Vapor which possesses the common Sensory. And the Fit returns when any Vapor or Humor of the same Nature suddenly takes possession again of the same common Sensory.

IX. This Distemper is very dangerous, because the most noble Part is affected, and because those vitious Humors or Vapors are not easily dispiers'd. But in this Patient there was great hopes of Cure, in regard the Malady was not generated in the Brain, but arose from another Place. Besides that, the Fits being short, we thence judge the common Sensory to be seized, not so much by a tough and viscous Humor, as by a thick Vapor, which is more easily attenuated and dispelled. However, in regard this thick Vapor may condense into a tough Humor, to the hazard of a more durable *Catalepsis*, and loss of Life it self, therefore the Cure is not to be delay'd.

X. The Method of Curing, is, 1. To discuss that thick Humor or Vapor, possessing the common Sensory. 2. To purge the Womb, and remove the Obstructions of it, and prevent a new Generation of that depraved Humor. 3. To prevent the assent of that Humor or Vapor to the Head. 4. To strengthen the Head, that it may no more admit of those Humors or Vapors, but may be able forthwith to dissipate and expel them.

XI. In the Fit, let this Sternutory be blown up into the Nostrils, that the Expulsive Faculty being provoked, the Vapor

Vapor or Humor may thereby be violently removed.

℞. *Root of white Hellebore* ℈j. ſ. *Pellitory, Leaves of Marjoram, Flowers af Lilly of the Valley, an.* ℈ſ. *Black Pepper Corns* n° vii. *Caſtoreum* gr. iiij.

Then anoint the Noſtrils, Temples and Top of the Head with this Liniment, and put a little Cotton dipped in it into the Ears.

℞. *Oil of Thyme, Roſemary, Sage, Caroways, Caſtoreum, Amber, an.* ℈ſ. *Martiate Oyntment* ℥j.

Then let this little Bag be hung about the Neck.

℞. *Caſtor, Aſſa Fetida, Camphor, an.* ℈j. ſ. *Sow them into a thin ſilk Bag.*

And in the mean time, omit not the giving of a ſtrong Gliſter.

XII. If after all this, the Fit remain, apply Cupping-glaſſes, with and without Scarrification to the Necks, Scapulas and Shoulders, with dolorific Ligatures, and painful Frictions of the Thighs and Feet. Then let this little Bag boil a little while in Wine, and then ſqueez'd, be laid warm upon the top of the Head.

℞. *Flowers of Roſemary, Marjoram, Thyme, Calamint, Flowers of Camomil and Stœchas, an.* M. ſ. *Seeds of Cummin, Caroways, Lovage, an.* ℥j. ſ. *Lawrel-berry, Nutmegs, an.* ℥j. *For a little Bag.*

XIII. The Fit being gone off, give this purging Draught.

℞. *Leaves of Senna* ℥ſ. *White Agaric* ℥j. *Seed of Lovage* ℈ij. *Decoction of Barley* q. ſ. *infuſe them, and add to the Straining Elect. Hiera Picra* ℥ij.

XIV. The Body being thus purged, open a Vein in the Ancle, and take away ſix or eight ounces of Blood.

XV. Then let the Patient drink three or four times a day, a Draught of this Apozem.

℞. *Roots of Fennel, Valerian, Dittany, Aromatic Reed, Male Pyony, an.* ℥ſ. *Herbs, Marjoram, Nipp, Calamint, Rue, Peniroyal, Water Trefoil, Baum, an.* M. j. *Flowers of Camomil, Melilot, Stœchas an.* M. ſ. *Seeds of Lovage and wild Carrots, an.* ℥ij. *Juniper Berries* ℥vj. *Water* q. ſ. *For an Apozem of* ℔j. ſ.

XVI. Theſe Medicaments are to be often repeated, as occaſion requires.

And as for the regular Courſe of living, let the Air be temperate and pure, perfumed ſometimes with Roſemary, Baum, Thyme, Rue, Lovage, Caſtor, and the like. The Diet of good Juice and eaſie Digeſtion, as ſuch as corroborates the Brain and Womb. The Drink ſmall, and without Setling. Sleep and Exerciſe moderate; and let all the Patients Evacuations be regular, and in due time, either ſpontaneous, or procured by Art.

HISTORY X.

Of Giddineſs.

A Woman, of thirty years of age, fat and luſty, of a flegmatic Conſtitution, having many times been troubled, ſo ſoon as Winter was over, with a heavy Pain in her Head, and Noiſe in her Ears, at length, in the Spring time, was taken with a Giddineſs that often went and came; firſt more mild, then more vehement, at what time, ſhe thought all things turned round, ſo that ſometimes ſhe could hardly ſtand upright, but fell down, unable to riſe, till the Giddineſs ceaſed; which preſently returned, if ſhe looked upon Wheels that ran round, Flame or Smoak aſcending upward; upon any rapid Stream, or from any Precipice. Her Appetite and Digeſtion were good; her Evacuations were regular and in Seaſon, and all the Bowels of the middle and lower Belly ſeemed to be in a good Condition.

I. Certain

I. CErtain it is, that the Seat of this Affection was in the Brain, in regard that Annoyance of the Sight did not proceed from any Fault of the Sight, or of the Medinum, or the Object.

II. This Malady, by the Physicians is called *Vertigo* or Giddineſs. *And is a Deception of the Sight, which makes that viſible Objects ſeem to turn round, ariſing from a kind of Whirl-pit Motion of the Animal Spirits in the Brain.*

III. The remote Cauſe is the External Motion, refrigerating the Brain, and ſtreightning the Paſſages of it, appointed for the evacuating of Excrements; ſo that Flegm abounding in the Body, and copiouſly collected in the Ventricles of the Brain, conſtitutes the containing Cauſe.

IV. By thoſe flegmatic Humors, the Ventricles are firſt diſtended; thence the heavy Pain. This Flegm augmenting, ſtops up the Paſſages of the Brain, through which the Spirits ought to paſs, partly by repletion, partly by compreſſion; ſo that the Spirits miſſing their direct Paſſage, and lighting upon the obſtructed Paſſage, gets thorough in a circular Motion, as Water falling with violence, if it meet a Dam in its way, recoils three or four times in Circles, before it run by.

V. Theſe whirling Spirits thus circularly carried to the Seat of the Mind, intermixing with the Images of viſible things, which are carried to the ſame Mind, are offered to the common Senſory with the ſame circular Motion, and ſo occaſion that Fallacy of Sight; by which all viſible Objects ſeem to be whirled about in the ſame manner as the Images of viſible things.

VI. But this ſame whirling of the Spirits does not laſt, partly, becauſe the narrowneſs of the Paſſages of the Brain is ſometimes more, ſometimes leſs; partly, becauſe the Spirits are ſometimes thicker, and ſometimes thinner, and paſs through ſometimes with more, ſometimes leſs violence; which is the reaſon the *Vertigo* comes by Fits: For in the Motion of the Body, the Spirits are moved with more violence, and in greater abundance, which if they cannot paſs freely and directly through the ordinary Paſſages of the Brain, but light here and there upon the obſtructed Paſſages, cauſes the Fit, whether they be thin or thick. For the Repulſe of the Obſtruction puts them into a Circumgyration; and the plenty and violent ruſhing of the thin Spirits makes them they cannot paſs; but the thick are ſtoped by reaſon of their thickneſs; and therefore Drunkards, and young People that abound with thin Spirits, are as much liable to Giddineſs, as old Men, whoſe Spirits are thicker. But the Giddineſs of old Men is more frequent, and laſts longer, becauſe of their more abounding Flegm; longer, and more frequently ſtreightens the Paſſages of the *Choroid-Fold.* Therefore the *Vertigo* ſeldom happens when the Body is in Motion, and is generally abated and cured by reſt.

VII. But becauſe there are not enough of thoſe whirling Spirits that make their way through the Paſſages of the Brain; beſides that, their Circumrotation hinders them from entring in ſufficient quantity into the Nerves: This was the reaſon that this Patient, for want of Animal Spirits in the Muſcles, often fell to the Ground, without being able to riſe before the Vertigos ceaſing, the Animal Spirits flowed more copiouſly again into the Muſcles.

VIII. Then the Fit returns again upon the Sight of Wheels turning round, Precipices, *&c.* becauſe the Images of thoſe things being carried to the inner Parts with that ſame whirling and unequal Motion affects the Animal Spirits with the ſame circular and unequal Motion. Upon the Sight of Precipices, the Vertigo returns; in regard the Sight of them ſtriking a Terror into the Beholder, the Affright ſtreightens the Paſſages, and by that means, puts a ſudden ſtop upon the Spirits, which being forced forward by thoſe that come behind, becauſe they have not a free Paſſage, are agitated by the Repulſe of the Obſtruction, and forced into a circular Motion.

IX. This Malady is hard to be cured, and many times turns to an Epilepſie, or Apoplexie, or ſome other grievous Diſtemper of the Brain, and therefore the Cure of it is not to be delay'd.

X. The Cure conſiſts in removing the primary, antecedent and continuing Cauſe, and Corroboration of the Brain.

XI. Firſt, Therefore let her be purged with theſe Pills.

℞. *Maſs of Pill. Cochiæ* ℈j. *Extract of Catholicon* ℈ſ. *Diagridion* gr. ij. *Syrup of Stœchas a little. For* vij. *Pills.*

XII. Though

XII. Though not much good can be expected from Blood-letting, yet least the Blood should fly up to the Head in too great a quantity, it may be taken from the Arm, or if it happen in the time of her monthly Customs, out of a Vein of the Foot. Let the Vein be opened, the Patient lying in Bed, and let her not see her own Blood.

XIII. Then let her drink three or four times a day, a Draught of this Apozem.

℞. *Root of Acorus* ʒj. *Elecampane, Fennel, an.* ʒs. *Herbs. Betony, Marjoram, Rosemary, Calaminth, Thyme, an.* M. j. *Sage, Leaves of Lawrel, Flowers of Stœchas, an.* Ms. *Seeds of Anise, Fennel, Caraways, an.* ʒj. s. *Cleansed Raisins* ʒij. *Water* q. s. *Boil them according to Art, adding toward the end White-wine* ℔ss. *Make an Apozem of about* ℔j. s.

Sometimes, instead of the Apozem, she may take a small quantity of this Apozem.

℞. *Specier. Diambræ* ʒj. *Sweet Diamosch* ℈j. *Candied Root of Acorus, Conserve of Flowers of Sage, Anthos, Baum, an.* ʒs. *Syrup of Stœchas* q. s.

XIV. In the mean time, let her use this Masticatory.

℞. *Root of Pellitory, Elecampane, an.* ʒj. *Herbs, Marjoram, Hyssop, an.* ʒs. *Black Pepper* ℈s. *Mastich* ʒv. *Reduce these into a Powder, and then make them into Trochischs with a little Turpentine and Wax.*

XV. Let her Temples, Nostrils and Top of her Head be anointed twice a day with this Oyl.

℞. *Oyl of Nutmegs distilled* ʒj. *Oyls of Rosemary, Amber, Marjoram, an.* ℈s.

She may also wear the following Quilt upon her Head for some Months.

℞. *Leaves of Rosemary, Melilot, Sage, Flowers of Melilot, an. one little handful, Nutmeg* ℈ij. *Cloves* ℈j. *Benjamin* ℈s. *Beat them grossly for a Quilt.*

XVI. Let her have a warm Room and good Air. Let her feed sparing, and let her Food be easie of Digestion, not flatulent, and seasoned with hot Cephalics, and carminative Seeds. Her Drink must be small, wherein, if a little Bag of Marjoram, Rosemary, and a little Cinnamon be hung, 'twill be so much the better. Moderate Sleep and Exercise is best, when the Giddiness is off; but let her Rest in the time of the Fit. Keep her Body soluble, and take care that all Evacuations be regular and natural.

HISTORY XI.

Of the Night-Mare.

A Woman of fifty years of age, in good plight, fleshy, strong and plethoric, sometimes troubled with the Head-ach, and Catarrhs falling upon her Breast in the Winter; the last Winter, molested with no Catarrhs, but very sore in the Day-time, but in the Night-time, when she was composing her self to Sleep, sometimes she believed the Devil lay upon her and held her down, sometimes that she was choaked by some great Dog or Thief lying upon her Breast, so that she could hardly speak or breath, and when she endeavoured to throw off the Burthen, she was not able to stir her Members. And while she was in that Strife, sometimes with great difficulty she awoke of her self, sometimes her Husband hearing her make a doleful Inarticulat Voice, waked her himself; at what time she was forced to sit up in her Bed to fetch her Breath; sometimes the same Fit returned twice in a Night, upon her going again to Rest.

I. THe Brain of this Woman was primarily affected, especially in the hinder Ventricle of the Brain, near the Spinal Pith, for the Muscles of the Parts seated below the Head, are agrieved, which appears by her difficulty of breathing, and the hindered Motion of her Breast, Thighs and Arms. Hence the Heart is affected with the Lungs.

II. This Affection is called *Incubus*, or the Night-Mare, *which is an Intercepting of the Motion of the Voice and Respiration, with a false Dream of something lying ponderous upon the Breast, the free Influx of the Spirits to the Nerves being obstructed.*

III. The antecedent Cause of this Malady, is an over-redundancy of Blood in the whole Body, whence many Vapors are carried to the Head, and there detained by the Winter-cold, streightning the Pores, and thickning those Vapors, and narrowing the Passage to the beginning of the Spinal Marrow, which hinders a sufficient Passage of the Animal Spirits to the Nerves; and this constitutes the containing Cause.

IV. For while the Passages of the Nerves are compressed by the more thick Vapors, detained about the lower part of the Brain; at the entrance of the Marrow into the Spine, sufficient Animal Spirts do not flow into the lower Parts, which causes the Motion of the Muscles to fail. Now, because the Motion of the Muscles, for the most part ceases in time of sleep, except the Respiratory Muscles, therefore the failing of their Motion is first perceived, by reason of the extraordinary trouble that arises for want of necessary Respiration. Now the Patient in her Sleep growing sensible of that Streightness, but not understanding the Cause in that Condition, believes her self to be overlay'd by some *Demon*, Thief, or other ponderous Body, being neither able to move her Breast, nor to breath. Then endeavouring to shake off that troublesome Weight, as apprehensive of some ensuing Suffocation, but not being able to move the rest of her Members, she believes them under the same Pressure. Upon which, when she tries to call out for assistance, but because of the streightness of her Respiration, she is not able to speak distinctly, she makes an inarticulate Noise with great difficulty. In this Strugling she continues, till the Animal Spirits, detained at the lower Part of the Brain, by the Compression of the Spinal Marrow, and there collected in a greater quantity, at length forced by the continual Flux of Spirits from the Heart, violently make their way through the Pith into the Nerves and Muscles, and restore Motion to the Parts. Then the Patient moves her Body and wakes, and by that motion those thick Vapors are dissipated, and being awake, she is forced to take Breath, to repair the Loss which she suffered for want of Respiration. But because there is yet a larger quantity of these Vapors still remaining in the Head, hence it comes to pass, that if she fall asleep again, especially if she lye upon her Back, the same Evil returns, in regard those thick Vapors settle more easily toward the hinder part of the Head near the Marrow.

V. Now that they are Vapors, and not Humors, is plain from hence, that the Malady is so soon mastered, which could not be done so suddenly were they Humors, which would rather cause an Apoplexie, or some other more dangerous Evil, that they are thick, and not thin Vapors, appears from hence, because the thin Vapors would pass more easily through the Pores, though narrower, which the thick cannot do, which requires motion of the Body to dissipate them; which Motion ceasing in Sleep, they stick to the Place and streighten the Pores of the Nerves. But if any cold ill Temper of the Brain happen at the same time, those Vapors are easily condensed into Humors by that Cold, which if detained in the Head, cause Heaviness, the *Coma*, Apoplexy, and the like. If they flow from the Head to the lower Parts, they breed Catarrs, with which our Patient was wont to be troubled in the Winter-time.

VI. This Malady is dangerous, least the collected Vapors being condensed in the Head, should breed a *Coma*, Apoplexy, or the like.

VII. It consists in removing the Antecedent, Principal and containing Cause, and the Corroboration of the Brain.

VIII. To purge away the Antecedent Cause, or the great quantity of Humors, let the Body be purged with *Pill. Cochiæ*, Powder of Diaturbith, or this Potion.

℞. *Leaves of Senna* ℥iij. *White Agaric, Rhubarb, an.* ℥j. ſ. *Anise-seeds* ℈ ij. *White Ginger* ℈ſ. *Decoction of Barley* q. ſ.

q. ſ. *Infuſe them, and to the Straining, add Elect. Diaphœnicon* ℥ij.

IX. Then becauſe ſhe is plethoric, take away ℥viij. or ix. of Blood from her Arm.

X. After Blood-letting, let her take every morning a Draught of this Apozem.

℞. *Root of Calamus Aromaticus, Fennel, Stone-parſley, Capers, an.* ℥vj. *Herbs, Betony, Marjoram, Dodder, Succory, Borage, Sorrel, an.* m. j. *Flowers of Stœchas* m.ſ. *Juniper Berries* ℥ſ. *Blew Currants* ℥ij. *Water* q.ſ. *Boil them according to Art, adding toward the end Rubarb, white Agaric, an.* ℥ij. *Aniſe-ſeed* ℥ſ. *Cinnamon* ℈j. ſ. *Make an Apozem of* ℔ ſ.

XI. To expel the containing Cauſe, *Errhinas* ſnuft up into the Noſtrils, or a ſneezing Powder of Root of white Hellebore, Pellitory, Leaves of Marjoram, and Flowers of Lilly of the Valley, greatly conduce.

XII. To corroborate the Brain, let her take a ſmall quantity of this Conditement.

℞. *Specier. Diambr. Aromatic. Roſat. an.* ℈ij. *Conſerve of Flowers of Betony, Sage, Anthos, candied Root of Acorns, an.* ℥ſ. *Syrup of Stœchas* q. ſ.

XIII. To the ſame purpoſe let her wear ſuch a Quilt as this upon her Head.

℞. *Leaves of Roſemary, Marjoram, Thyme, Flowers of Lavender, an.* ℥j. *Nutmegs* ℈ij. *Cloves* ℈j. *Benjamin* ℈ß. *Beat them into a groſs Powder.*

XIV. Keep her in a pure and moderate hot Air. Let her Diet be ſparing, but of good Juice and eaſie Digeſtion. Let her Suppers be more moderate then her Dinners. Her Drink muſt be ſmall, her Exerciſe moderate, and ſo muſt her Sleep be, and let her be careful of ſleeping upon her Back. Laſtly, a ſedate Mind, and a ſoluble Body are of great moment in this Caſe.

HISTORY XII.

Of the Apoplexy.

A Strong Man, about forty years of age, both a great Feeder and Drinker, complained of a heavy Pain in his Head for two Months together, but took no care of himſelf, but followed on his uſual Courſe of Drinking Fore-noons and After-noons; but at length, one Morning waking in his Chamber, after he had muttered out three or four inarticulate Words, he fell of a ſudden void of Senſe or Motion, only that he breathed, and had a ſtrong Pulſe.

I. THat this man's Head was terribly afflicted, the Ceſſation of the Animal Functions ſufficiently declared.

II. This Affection is called an Apoplexy, which is a ſudden Privation of all the Animal Functions, except the Act of Reſpiration.

III. It is plain that it was no Lethargy, Syncope, Sleepy Coma, Catalepſis, or Epilepſie, becauſe the Patient, without any Fever, lay almoſt immoveable, inſenſible, nor could be waked by any means; having all his Members languid, only with a ſtrong Pulſe, and a heavy Reſpiration, which are no Simptoms of the foreſaid Diſeaſes.

IV. The Brain is affected about the beginning of the Pith, which is the Original of all the Nerves, then beſieged by a Flegmatic Humor.

V. The remote Cauſe was continual Gluttony and Drunkenneſs, by which the Brain in a long time was extreamly weakned, and the many crude and Flegmatic Humors generated therein, and collected together in the Ventricles, made the Antecedent Cauſe, which afterward ſetling at the Original of the Nerves, conſtituted the containing Cauſe.

VI. The Animal Spirits being hindred by thoſe Humors, contracting the Pores of the beginning of the Nerves,

presently all the Animal Functions ceaſe, and the Patient becomes void of Senſe and Motion, except Reſpiration; becauſe the Spirits ſtill flow thither by reaſon of the largeneſs of the Pores of the Reſpiratory Nerves. But the Diſtemper laſting, together with the Flegmatic Obſtruction or Compreſſion, the Influx of the Spirits into them is alſo ſtop'd, which cauſes the Reſpiration alſo to fail, and thence a heaving and ratling in the Throat.

VII. The Pulſe beats well, becauſe the Blood ſent from the right Ventricle of the Heart to the Lungs, is ſufficiently, as yet, refrigerated; but if the Diſeaſe continue, the Pulſe will alſo fail, becauſe the Blood of the right Ventricle of the Heart, is not ſufficiently ventilated and cool'd, ſo that little Blood comes to the left Ventricle, which weakens the Motion of the Heart.

VIII. This Diſeaſe is very dangerous; yet becauſe it is but in the beginning, and Reſpiration is not yet come to Ratling, and for that there is a ſtrong natural Heat remaining in the Patient, there is ſome hope of Cure, though not without ſome fear of a Palſie that will enſue the Cure.

IX. The Method of Cure, the removal of the flegmatic Humors, obſtructing the beginning of the Nerves; to prevent a new Generation and Collection of them, and to corroborate the Brain.

X. Let the Body be moderately moved, let the Hairs be plucked, and laborious Rubings and Ligatures of the Arms and Thighs. This Gliſter may be alſo adminiſtred.

℞. *Wormwood, Rue, Pellitory of the Wall, Mercury, Hyſſop, Beets, Leſſer Centaury, an.* M. j. *Leaves of Senna* ʒj. *Celocynth ty'd in a Bag* ʒj. *Aniſeſeed* ʒv. *Water* q. ſ. *Boil them according to Art.*

℞. *Of the Straining* ʒx. *Elect. Hiera Picra, Diaphœnicon, an.* ʒj. *Salt* ℈iiij. *for a Gliſter.*

Or inſtead thereof, this Suppoſitory.

℞. *Specierum Hieræ* ʒj. *Trochiſes, Alhanhal* ℈ſ. *Salt Gemma* ℈j. *Honey* ℈vj. *Make a Suppoſitory, and at the end of it, faſten* gr. iiij. *of Diagridium.*

XI. After he has taken this Gliſter, Bleed him moderately in the Arm; then apply Cupping-glaſſes with and without Scarification to his Neck, Shoulders, Scapulas and Legs.

XII. Let this Sneezing Powder be alſo blown up into the Noſtrils.

℞. *Roots of white Hellebore* ℈j. *Pellitory of* Spain ℈ſ. *Leaves of Marjoram* ℈j. *Black Pepper, Caſtoreum, an.* gr. v. *For a Powder.*

XIII. Outwardly, let this little Bag be applied warm to his Head.

℞. *Salt* M. j. ſ. *Sea-ſand* Mij. *Seeds of Cummin, Fennel, Lovage, an.* ʒij. *Cloves* ʒj. ſ. *Heat them in a dry Stone Pot, put them in a linnen Bag, and apply them warm to the Head.*

XIV. Let the Noſtrils, Temples and Top of the Head be anointed with this Liniment.

℞. *Ovls of Caſtor, Lavender, Roſemary, Amber, an.* ℈j. *Martiate Ointment* ʒj.

XV. When the Patient begins to come to himſelf, give him now and then a Spoonful of this Water.

℞. *Water of Tylet Flowers, Lilly of the Valleys,* Aqua Vitæ *of* Matthiolus, *Syrup of Stœchas, an.* ʒj.

XVI. Let him then be purged with *Pill. Cochiæ,* extract of *Catholicon, Elect. Diaphenicon* or *Hiera Picra,* Powder of *Diaturbith,* or the Infuſion of ſuch kind of Flegm-purging Ingredients.

XVII. After Purgation, let him take this Apozem.

℞. *Roots of Sweet Cane, Fennel, an.* ʒvj. *Galangal* ʒiij. *Marjoram, Betony, Roſemary, Rue, Calamint, Hyſſop, an.* M. j. *Flowers of Stœchas* M. ſ. *Cordial Flowers, an. one little Handful, Juniper Berries* ʒvj. *Seeds of Aniſe, Fennel, an.* ʒij. *Water and Hydromel, equal parts. Make an Apozem of* ℔j. ſ.

Of which, let him take four or five ounces thrice a day, with a ſmall quantity of this Conditement.

℞. *Specier. Diambre* ℈iiij. *Sweet Diamoſch* ʒſ. *Roots of ſweet Cane candied, Conſerves of Betony, Anthos and Flowers of Sage, Syrup of Stœchas,* q. ſ.

XVIII. Let

XVIII. Let this Quilt be laid also upon his Head.

℞. *Leaves of Marjoram* M. j. *Rosemary, and Flowers of Lavender, an. two small Handfuls, Cloves, Nutmegs, an.* ℥jj. *Benjamin* ℥j. *Beat them into a gross Powder, and quilt them into red Silk.*

XIX. An Air moderately hot and dry, either by Art or Nature, is most proper for this Distemper. Meats of good Nourishment and easie of Digestion, condited with Rosemary, Marjoram, creeping Thyme, Sage, Betony, Baum, Hyssop, the Carminative Seeds, and Spices, *&c.* Small Drink, and sometimes a little Hypocras, Short Sleeps, moderate Exercise, and orderly Evacuations.

HISTORY XIII.

Of the Palsey and Trembling.

A Virgin, twenty five years of Age, of a Flegmatic Constitution, having for a long time fed upon Sallads, Cucumbers and raw Fruit, afterwards complaining of heavy dozing Pains in her Head, at length, fell Apoplectic to the Ground, without Motion or Sense, except Respiration. The Physician who was sent for, had brought her to this pass, that after six hours she opened her Eyes again, and after twenty hours, was fully restored to her Senses, and spoke; but all the Left-side of her Body below the Head, remain'd immoveable, with a very dull Sense of Feeling. Yet her Monthly Customs observed their Periods, though not so copious.

I. THat Affection which remained, after the weak Apoplexy went off, is called a Palsie, *Which is a Privation of Voluntary Motion or Sense, or both, in one or several Parts of the Body.*

II. The Part affected is the Spinal Pith, chiefly about the beginning of it; where the one half Part of it being compressed or obstructed by the Flegmatic Humor, expelled from the Brain, disturbs the Use of all those Nerves proceeding from that side, and by consequence of the Muscles.

III. The remote Cause is disorderly Diet, and the too much use of cold things, whence many flegmatic Humors being generated in a flegmatic Body, cause an oppressive Pain in the Head, which is the antecedent Cause, which also afterwards obstructing the Original of the Marrow of the Brain, and afterwards cast off by one half, but still obstructing the other, constitute the containing Cause.

IV. Thus the Motion of the Left-side was taken away, because that half of the Pith being obstructed, the Animal Spirits could not enter into that half of the Pith, nor the Nerves proceeding from it, which causes a Cessation of the Actions of the Instruments of voluntary Motion, or the Muscles on that side. But the Sense is not quite lost, but remains very dull, because that several Spirits pass through the contracted Pores of the Pith, sufficient for Motion, yet not anew to impart Sense to the feeling Parts.

V. This Malady is hard to be cured, by reason of the detension of a viscous and tenacious Humor in a cold Part; but Youth and Strength of Body promise hopes of Recovery.

VI. The Method of Cure requires the Attenuation and Dissipation of the Obstructing Humor. 2. To prevent the Afflux of any more. 3. To take away the antecedent Cause. 4. To corroborate the Parts affected.

VII. For Evacuation of the Flegmatic Humor, give these Pills.

℞. *Mass of Pill. Cochiæ* ℥ß. *Extract of Catholicon* ℥ß. *with a little Syrup of Stœchas, make up* vij. *Pills.*

Instead of them may be given Powder of *Diaturbith* or *Diacarthamum* ℥j. or a Draught of an Infusion of Leaves of Senna, Root of Jalap, Agaric. These Purges are to be repeated by Intervals.

VIII. Blood-

VIII. Blood-letting is not proper in this Case.

IX. To corroborate the nervous Part of the Body, and prevent the Generation of flegmatick Humors, let him take this Apozem.

℞. *Root of Acorns, Fennel, an.* ℥vj. *Florence Orice* ℥iij. *Betony, Ground-pine, Marjoram, Rosemary, Calamint, Thime, an.* M. j. *Flowers of Stœchas* M. ſ. *Seeds of Fennel, Caroways, Bishops-weed, an.* ℥j. ſ. *Water and Wine equal parts, boil them to a Pint and a half, and to the Straining add Syrup of Stœchas* ℥iij. *For an Apozem.*

Of which, let the Patient take four ounces three or four times a day, with a ſmall Quantity of this Conditement.

℞. *Specier. Diambr. Diamoſch Dulcis, an.* ℈iiij. *Conſerve of Flowers of Sage, Anthos, Root of Acorns candied, an.* ℥v. *Syrup of Stœchas* q. ſ.

X. The Uſe of Paralitic and Apoplectic Waters will be very proper in this Case; of which there are ſeveral to be found among the Preſcriptions of Phyſicians.

XI. If the Diſeaſe will not ſubmit to theſe Remedies, let him take every Morning five ounces of the following Decoction, and ſweat in his Bed, according to his Strength.

℞. *Lig. Guaiacum* ℥iiij. *Saſſafras, Sarſaperil, an.* ℥ij. *Water* ℔vij. *Macerate theſe twenty four hours; then boil them, adding toward the end Roots of Acorns, Valerian, Butter-bur, Fennel, an.* ℥vj. *Galangale, Licorice ſlic'd, an.* ℥ij. *Herbs, Betony* Miij. *Ground-Ivy,* M. ij. *Thyme, Marjoram, Roſemary, Flowers of Stœchas, an.* M. j. *Sage* Mſ. *Juniper-berries* ℥j. *Boil them to* ℔. iij.

XII. For Corroboration of the Head, prepare this Quilt.

℞. *Flowers of Roſemary, Marjoram, Thyme, Flowers of Lavender, Melilot, an. one ſmall Handful, Cloves, Nutmegs, an.* ℈ij. *For a Quilt.*

XIII. While theſe things are doing, let the Spine of the Back be well chafed with hot Cloaths, eſpecially in the Neck about the Head, and then fomented with a Fomentation of hot Cephalics boiled in Wine; or elſe anoint the Neck with this Liniment warm.

℞. *Oyl of Foxes, Spike, Rue, Gooſe and Cats-greaſe, an.* ℥vj. *Oyl of Turpentine* ℥ſ. *Oil of Peter, Roſemary, Amber, an.* ℈ij. *Powder of Caſtoreum* ℈iiij.

After Unction and Friction, lay on this Plaiſter.

℞. *Pul, Caſtoreum* ℥ij. *Benjamin* ℥j. *Galbanum, Opoponax diſſolved in Spirit of Wine. Emplaſter of Betony, Lawrel-Berries, and Melilot, an.* ℥vj. *Mix them according to Art.*

XIV. This Diſeaſe requires a hot, dry and pure Air. Meats of good juice and eaſie Digeſtion, calefying and attenuating. For Drink, Hydromel or Wine, imbib'd with Roſemary, Marjoram, Betony, Cardamum, *&c.* Now and then a Draught of Hypocraſs, or a Spoonful of Juniper-wine, or Anthos-wine, or Aquæ Vitæ of *Matthiolus* will not be improper; avoid long Sleeps and Repletion, and let Natures Evacuations be regular and due.

HISTORY XIII.

Of Trembling.

A Man, fifty years of Age, ſtruck with a great and ſudden Terror, immediately fell down, fixing his Eyes upon the Standers by, but not able to ſpeak: Soon after recovering his Spirits, he talked well enough, but roſe up with a Trembling over his whole Body. From that time, when he moved his Limbs, the Trembling ſtill remained, which as his Body drew cold, was more violent, as he grew warm, abated.

I. *Trembling*

I. TRembling *is a Deprivation of the Voluntary Motion of the Limbs, by which they are agitated with a contrary Motion, in a continued Viciſſitude.*

II. The antecedent Cauſe is a Flegmatic Humor contained in the Brain, which being ſtirred by the great ſudden and diſorderly Commotion of the Spirits proceeding from the Terror, and caſt off to the Pith of the Spine, conſtitutes the containing Cauſe.

III. For the Humor in that place contracting the Pores of the Pith, prevents the free Influx of the Animal Spirits through the Marrow into the Nerves and Muſcles. So that not being ſufficient to perfect the voluntary Motion, it happens that the Limbs are moved forward by a voluntary Motion, but are depreſſed by their own Weight, ſo that both together cauſe a trembling Motion.

IV. This Trembling is more vehement in the Body, when cold; leſs violent when the Body is warm: Becauſe the Pores are more contracted by the Cold, and more dilated by the Heat. Which cauſes a freer or leſs open Paſſage to the Animal Spirits, and conſequently a more or leſs vehement Trembling.

V. This Trembling is not a little dangerous, for it may turn to a Palſey, or may be accompanied with an Apoplexy, a Carus, or a Lethargy.

VI. The Cure is the ſame as of the Palſey.

HISTORY. XIV.

Of a Convulſion.

A Maid, about thirty years of Age, received a Wound in her Right-arm, which laid a Nerve bare, but unhurt. However ſhe lay in a cold Place, and by reaſon of her Poverty, not well guarded againſt the Cold, and beſides an unskilful Chyrurgeon, having ſtopped the Blood, put a Tent into the Wound dipped in *Egyptiacum* and the Apoſtles Oyntment, which cauſed a moſt painful and vehement Convulſion in her Arm; which ſoon after was accompanied with a Convulſion of the Thigh on the ſame ſide, and of her Arm and Thigh on the other ſide, which laſted ſometimes half a quarter, ſometimes an Hour, ſometimes half an hour, intermitting and returning. She was in ſuch Pain, that many times it made her talk idly.

I. THE Nerves and Muſcles of this Patient were affected, as appeared by the Motion not ſpontaneous, and that ſtill more encreaſe; and her Head was grieved, as appeared by the Delirium.

II. This Simptom is called a *Convulſion, which is a continued and unvoluntary Contraction of the Nerves and Muſcles toward their beginning.*

III. The remote Cauſe was the Wound received, which laid the Wound bare. The next Cauſe was the ſharp and biting Oyntment, provoking the Nerve, and the cold Air no leſs troubleſome to it.

IV. Which Vellication of the Nerve being communicated to the Nerve, and perceived by the Mind, preſently more copious Spirits were determined to the Place affected for its Relief, which diſtending in breadth the Nerve and Muſcle belonging to it, but contracting it in length, cauſed the Convulſion. By the Pain of this Convulſion, the Head being troubled, ſends the Animal Spirits diſorderly to theſe or other lower Parts, and ſo contracting them in the ſame manner, the Contraction happens not only in the wounded, but in other Parts likewiſe; and from this great Diſturbance of the Brain and Animal Spirits happens a Delirium.

V. This is a dangerous Malady; for beſides the Nerves and Muſcles, the noble Bowel is diſtmpered. Therefore, ſays *Hippocrates, a Convulſion enſuing a Wound is very dangerous.* But the Youth and Strength of the Patient promiſes great hopes of Cure, beſides that, the Convulſion proceeds from an external Cauſe that may be removed.

VI. The

VI. The Method of Cure consists in keeping the Patient warm, and in a warm Place, in removing the sharp and biting Ointment, and washing the Wound with Barley-water boiled with Hyssop, and a little Honey dissolved in it; then put a Tent into it dipped in this Ointment.

℞. *The Yolk of an Egg*, n° j. *Honey, Turpentine, an.* ℥iij. *Spirit of Wine* ℥ij.

Then lay on Emplaster of Betony or Melilot.

VII. The Parts afflicted, and especially the wounded Arm, are to be fomented with this Fomentation.

℞. *Marjoram, Rosemary, Betony, Calamint, Hyssop, Basil, an.* M. j. *Flowers of Dill* M. ij. *Of Chamomil, Melilot, an.* M. j. ſ. *Seeds of Cumin* ℥j. *of Lovage* ℥iij. *Of Dill* ℥ſ. *White-wine* q. ſ. *Boil them to* ℔iij.

VIII. After Fomentation, strongly chafe the Parts affected with this Liniment warm.

℞. *Martiate Ointment, Oyl of Ireos, Oyl of Foxes, Earth-worms and Spike, an.* ℥j. *Oyl of Castor* ℥ſ.

IX. In the mean time, after a Glister given, let the Parties take a Draught of this Apozem to strengthen the Brain and Nerves.

℞. *Root of sweet Cane, Fennel, Male Piony, an.* ℥vj. *Herbs, Of Majoram, Rue, Betony, Rosemary, Baum, Basil, Calamint, an.* M. j. *Flowers of Stœchas* M. ſ. *Fennel Seed* ℥ij. *Raisins cleansed* ℥ij. *Water* q. ſ. *Boil them to* ℔j. ſ. *Then mix Water of Tilet Flowers, Syrup of Stœchas, an.* ℥iij.

X. Now and then let her take a small quantity of this Conditment.

℞. *Species Diambra* ℈iiij. *Candied Root of sweet Cane, Conserve of Flowers of Sage, Betony, Anthos, an.* ℥ſ. *Syrup of Stœchas*, q. ſ.

XI. Lastly, clap such a quilted Cap upon her Head.

℞. *Leaves of Marjoram* M. ſ. *Of Rosemary, Betony, Flowers of Dill, Melilot, an. Two little Handfuls, Nutmegs* ℥j. *Benjamin* ℥ſ. *Beat them into a Gross Powder for a quilted Cap.*

XII. The Convulsion ceasing, the Body must be purged with an Infusion of Leaves of Senna, Rubarb, Agaric, *&c.* or with *Cochiæ* or Golden Pills, *Diaphenicon*, or *Diaturbith*, with Rubarb. And then return to the use of the foresaid Apozem and Conditement.

XIII. Her Diet must be easie of Digestion, condited with Marjoram, Hyssop, Rosemary, Betony, Sage, Aniseseed, Fennel-seed, and the like. Let her sleep Long, and take her Rest as much as may be. And be sure the Body evacuate regularly.

HISTORY. XV.

Of the Epilepsie.

A Boy of eight years of Age, indifferent lusty, no care being had of his Diet, first became sad, and the Winter being past, often complain'd of a grievous Head-ach. In *March*, as he was at play, he fell down of a sudden, quite senseless, writh'd his Eyes, and clutch'd his two Thumbs hard in his Fists. That Fit soon went off; but the next day it returned much more vehement, attended with manifest Convulsions of the Body. From that time the Fits returned twice, thrice, and four times a Week, with more terrible Convulsions. But in the Summer they were much gentler, and not so frequent. But the Autumn following, especially near Winter, the Fits took him very often, and very violent, and that too of a sudden without any warning, with horrid Convulsions and Foming at the Mouth. And at last, the Con-

continuance and violence of the Distemper had so disordered the Animal Functions, that the Child was become sottish.

I. THAT the Boys Brain was affected, was plain by the distress of the Animal Functions.

II. This Distemper is called an *Epilepsie*, *Which is a Convulsion of the whole Body, not perpetual, with which the Party taken falls to the Ground, with an intercepting of the Senses and Functions of the Mind, rising from a Peculiar malignant and acrimonious Matter.*

III. Bad Diet contributes much to the breeding of this Disease (as the greedy devouring of bad and raw Fruit) which heaps up Crude and Flegmatic Humors in a Flegmatic Body; and these filling the Brain, first caused the Head-ach; then through their long stay in the Brain, obtaining a certain peculiar pravity and acrimony, constitute the containing Cause of the *Epilepsis*.

IV. From this depraved and acrimonious Humor exhale sharp and malignant Vapors, which as often as they twitch and bite the beginning of the Nerves, about the heat of the common Sensory, so often they cause the Fit. For while Nature endeavors to shake off that troublesom Acrimony from the sensible Parts, it happens that as the Spirits flow in greater or less quantity into them, they contract and relax alternately, and move the rest of the Nerves and Muscles of the Body after the same manner; whence those short and frequent Convulsions.

V. Now because this Malignant and sharp Humor chiefly and oftenest afflicts the small diminutive Nerves, near the seat of the common Sensory, hence it comes to pass, that the fit so suddainly seizes. For so soon as those little Nerves feel that Acrimony, Nature endeavors to shake it off. And because that endeavor is made, and begins near the common Sensory; therefore there is a stop put upon the Functions of the Senses and Mind. For in regard the Pine Kernel is presently affected, and for that the Influx of the Animal Spirits through the Nerves sometimes contracted, sometimes relaxed, can never be regular, hence it happens that the Organs of the Senses become defective in their Functions, and by reason of that disorderly Influx of the Spirits into the Nerves and Muscles, the Patient presently falls.

VI. The Fits are milder and not so frequent in Summer. For that the Pores of the whole Body are more open, by reason of the External heat, so that there is a greater dissipation of the Humors; and considering the time of the year less Flegm is bred and heaped up in the Brain. Therefore in *Autumn* and *Winter* they are most frequent and violent, because of the greater abundance of Flegm then bred, and less easie to be dissipated through the Pores then contracted with Cold; besides the Vapors exhaling from it, are more abundant and acrimonious.

VII. The Foam at the Mouth proceeds from hence; for that those Flegmatic Humors expelled from the Brain into the Jaws and Lungs, by that vehement agitation, by reason that respiration is hindered, grows hot in those places, and being mixed with the Air, unequally and difficultly passing to and fro, by vehement respiration are forced all frothy into the Mouth.

VIII. The Fit lasts, till that malignant and sharp Vapor be altogether discussed; and returns again when the depraved matter, stirred anew, sends forth the same Vapors to the Original of the Nerves. The Fit is more or less vehement, and does less hurt to the principal Functions, according to the quantity and quality of the evil Matter.

IX. Now because this ill and acrimonious Humor is bred in the Brain, and because the Fits were frequent and vehement, and the Disease of nine Months standing, therefore the Cure was difficult, but the Strength and Age of the Patient gave great hopes of Cure. For being but a Child, the very change of Youth out of one Age into another many times effects the Cure, as *Hippocrates* testifies.

X. The Cure is to be performed either in the Fit, or when the Fit is gone off. In the Fit, Castor, green Rue, Oyl of Marjoram, Amber, Nutmegs and the like are to be held to the Nostrils.

XI. When the Fit is past, the Original Causes are to be taken away, the antecedent Cause to be removed, the depraved quality of the containing Cause to be removed, and the whole Brain to be corroborated.

XII. Let the Body be gently Purged with two drams of *Heira Picra* or *Diaphœnicon*; or with one Scruple and a half of Powder of *Diacarthamum*; or an ounce of Purging blew Currans.

XIII. Then let him drink twice or thrice a day a draught of this Decoction.

℞. *Roots of Male Piony, Miſletoe, Saſſafras-wood an.* ℥vj. *of Calamus Aromatic. Valerian an.* ℥. ſ. *Herbs, Marjoram, Rue, Calamit, Roſmary, Vervan, Laurel-leaves, Flowers of Stœchas an.* M j. *Juniper-berries* ℥ ſ. *Seeds of Aniſe, Wild Carrots, Fennel an.* ℥ j. *Seed of Male Piony* ℥ iij. *Raiſins cleaſed* ℥ ij. *Water* q. ſ. *Boil them to an Apozem of* ℔ j. ſ.

Before he drinks this, let him take a ſmall quantity of the following Conditement.

℞. *Spicier. Diambr.* ℥ j. ſ. *Roots of ſweet Cane candied, Conſerves of Anthos, Flowers of Sage, Betony, an.* ℥ ſ. *Syrup of Stœchas* q. ſ.

XIV. Sometimes inſtead of the Apozem, he may take a ſpoonful of this mixture.

℞. *Epileptic water of Langius* ℥ iij. *Water of Lime-tree Flowers, of the Lilly of the Valleys an.* ℥j. *Syrup of Stœchas* ℥ j. ſ.

XV. Upon his head let him wear this Quilted Cap.

℞. *Leaves of Marjarom, Roſemary, Thime, Flowers of Lavender and Red Roſes an. Two ſmall handfulls. Cloves, Benjamin an.* ℈ j. *Beat them into a groſs Powder.*

XVI. Let the Patient be kept in a warm Air; his food muſt be Meats of eaſie digeſtion condited with Marjoram, Baum, Roſemary and other Cephalics. His drink muſt be ſmall; his ſleep and exerciſe moderate; and his Evacuations regular. Raw Fruit, Garlick, Onyons and Swines Fleſh, and all other Meats of hard digeſtion and ill juice are nought.

HISTORY. XVI.

Of a Catarrh.

A Man of forty Years of Age, of a cold Conſtitution, and one that had long uſed a cooling and moiſtning Diet, was troubled firſt with a heavy Pain in his Head, with a proclivity to ſleep. Afterwards he was troubl'd with a vehement Cough, ſometimes with deafneſs, noiſe in his Ears, Pains in his Neck, Teeth, Shoulders, and other Parts, ſometimes a moſt terrible Cough took him, not without ſome difficulty of breathing and danger of Suffocation, ſometimes he had nauſeouſneſs, and was moleſted with troubleſome Belchings and Pains in his Stomach; under his lower Jaw roſe Flegmatic Tumors, which fell and vaniſhed ſoon after; his Noſtrils were more then uſually dry and he ſpit little. He complained alſo that he felt a continual chilneſs in the top of his Head; and that his Hair was not ſo moiſt as it uſed to be.

I. HEre is one moleſted with a Catarrh, which is a Preter-natural Defluxion of Humors from the Head to the lower Parts.

II. The remote cauſe of this Diſtemper was a cold raw and Flegmatic nouriſhment, which over-cool'd and weakened the Bowels ſerving to Concoction, and bred a great quantity of Excrementitious Flegm, which was the antecedding Cauſe of the Diſtemper: and which being colected, and accumulated in the Brain, over-cool'd it, and thence fell down upon the lower Parts.

III. This Flegm augmented in the Brain, becauſe it had not heat enough to concoct and diſſipate ſo cold and thick a Humor; beſides that the Paſſages to the Noſtrils and Palate were obſtructed.

IV. This

IV. This Obstruction happens in the inner Parts of the Head by reason of the viscosity of the Humors stuffing up the narrow Passages for the Evacuation of those Excrements. Therefore not able to pass the regular way, they flow to the inner Parts of the Ear, where they cause Noises, Deafness and Pain; sometimes to the Larinx and Lungs, which causes vehement coughing and danger of Suffocation; sometimes to the Stomach and other Parts, where they breed several Maladies. In the Exterior Parts this Obstruction happens, by reason the Pores in the top of the Head, are filled with Humors contracted by the External cold: and that cold continuing in those refrigerated Parts, causes that chilness complained of by the Patient. And this cold not only hinders the Passage of the Vapors, but condenses them under the *Pericranium*, into a serous and flegmatic Humor, which being ill concocted becomes salt and sharp. Which for want of dissipation falls down upon the Teeth, Neck, Shoulders, *&c.* and causes those Pains complained of.

V. That the ordinary Passages were obstructed is apparent from the drineſs of the Patients Nostrils and Hair, and because he spit so little.

VI. This Affection is not a little dangerous, in regard the Symptoms that attend it may bring a Man into a Consumption; and breed occult and dangerous Apostems in the inner Parts.

VII. In the Method of the Cure, the Body must be Purged twice or thrice with *Pill. Chochiæ*, Powder of *Diaturbith* or *Diacarthamum*, or such a draught as this.

℞. *Leaves of Senna* ʒiij. *White Agaric.* ʒ j. ſ. *Anise-seed* ʒ j. *Choice Cinnamon white Ginger an.* ϑ ſ. *Decoction of Barley* q. ſ. *Infuse them, then add to the straining Elect. Hiera Picra* ʒ j. *Diaphœnicon* ʒ ij.

VIII. Then the Brain is to be dried and strengthened with the following Apozem.

℞. *Roots of Acorus Fennel, an.* ʒ vj. *Galangal* ʒ iij. *Herbs, Marjoram, Betony, Thime, Rosemary, Baum, Calamint, an.* M. j. *Laurel-leaves, Flowers of Stœchados an.* M. ſ. *Seeds of Anise, Fennel an.* ʒ ij. *Laurel-berrys* ʒ ſ. *Water and Wine equal Parts, Boyl them to an Apozem of* ℔j. ſ. *Of which let him take three or four draughts a day.*

IX. Noon and Night after Meals let him take a small quantity of this Conditement.

℞. *Specier. Diambr, Diamosch, Diagalanga, an.* ʒ ſ. *Conserve of Anthos, red Roses, an.* ʒvj. *Candy'd Roots of Acorus,* ʒiij. *Syrup of Stœchas,* q. ſ.

X. While he follows this course, Masticatories and Errhines may be used; and the taking of Tobacco is very Beneficial.

XI. Decoctions of *Guaiacum*, Sassafras and Sassaparil prepared with hot and drying Cephalics to provoke Sweat now and then are of great use.

XII. This Quilt may be made for the Patient to lay upon his Head.

℞. *Leaves of Rosemary, Marjarom, Thime, Flowers of Lavender an. two small handfuls, Mastic, Frankincense an.* ʒ j. *Cloves, Nutmegs an.* ϑ j. *For a Quilt.*

To anoint the Temples and top of the Head, which is every day to be done use this Liniment.

℞. *Oyls of Rosemary, Amber, Marjoram an.* ϑ j. *Oyl of Nutmegs pressed* ϑ ij. *Martiate Oyntment* ʒ ij.

XIII. If notwithstanding all this, the Catarrh continue, make an Issue in one Arm or in the Neck.

XIV. Let him keep in a moderately warm Air; observe a good Diet, roasted rather then boil'd, condited with Spices and hot Cephalics, avoid Radishes, Mustard, Garlic, Onions, which raise and fill the Head with Vapors. His Drink must be sparing, but strong; moderate sleep and moderate Exercise.

HISTORY XVII.

Of an Opthalmy.

A Perſon about thirty Years of Age, abounding with hot and Choleric Blood, having heated himſelf the laſt Winter at an extraordinary compotation of ſtrong Wine, and then expoſing himſelf in a bitter cold Night to the extremity of the weather, preſently felt a ſharp pain in his Eyes, with a burning heat; the next day a very great redneſs appeared in the white of his Eye, with a manifeſt ſwelling of the little Veins. He could not endure the light, ſo that he ſat continually with his Eyes ſhut, ſharp Tears flowed from his Eyes, which when he opened his ſight appeared to be very dim.

I. HEre the Part affected was the Eye, in which the annate Tunicle or the Conjunctive Tunicle, was chiefly aggreived, the other Parts of the Eye, only by Accident.

II. This Diſeaſe the Phyſitians call an *Opthalmy*, or Bleer-eyedneſs, *which is an Inflammation of the annate or white Tunicle, accompanied with redneſs, heat, pain and tears.*

III. The Antecedent Cauſe of this Diſeaſe, was an abundance of hot Blood through the whole Body, which being violently ſtirred by the extraordinary heat cauſed by the Wine, and ſuddainly detained by the Original Cauſe or the outward extream Cold, and overflowing the conjunctive Tunicle, conſtitutes the containing Cauſe.

IV. For the blood being moved more rapidly through the Arteries and Veins by reaſon of the extraordinary heat of the Wine, was thickned of a ſuddain by the external Cold received into the Eye; ſo that it could not paſs ſo ſpeedily through thoſe little Veins, as it was ſent from the Heart, which caus'd the Veins of the Tunicle to ſwell, and diſtended the Tunicle it ſelf; and the ſtay of the Blood corrupting it, and cauſing it to wax hot and ſharp, produced the Inflammation.

V. The Pain was occaſioned partly by the diſtention of the Tunicle; partly by the acrimony of the Humors corroding the Tunicle.

VI. He could not endure the Light, partly becauſe the Pain was exaſperated by admiſſion of the Exrernal Air; partly becauſe the Eyes being opened the Animal Spirits preſently flow into it, as they are determined for the benefit of ſeeing, and diſtend the Eye, which deſtenſion augments thePain, for the avoiding of which the Patient keeps his Eyes ſhut, to avoid the diſtenſion of the Part.

VII. Now in regard the ſight proceeds from the copious Influx of the Spirits into the Eye, and becauſe the Tunicle cannot endure that diſtenſion, hence the Eyes being open, the ſight grows dim; in regard that the fewer the Spirits are, the duller the ſight is.

VIII. The Tears iſſue forth, chiefly upon opening the Eye, by reaſon that the Caruncle in the larger corner of the Eye, that lies upon the hole in the Noſe, is twitched and contracted in each Eye by the neighbouring Inflammation: eſpecially if any injury of the Air accompany it, and by reaſon of that painful contraction does not exactly cover the Lachrymal point, ſo that the hole being looſe and open, the Tears flow forth in greater abundance. And they are ſharp by reaſon of the Salt mixt with the ſerous Humor, and ſeem to be much ſharper then they are, by reaſon of the exquiſite Senſe of the Tunicle, which is now already moleſted.

IX. This *Opthalmy* threatens great danger to the Eye, in regard that by reaſon of the Winter cold, the diſcuſſion of the Humors flowing into the Annate Tunicle is the more difficult, and the longer ſtay of it may hazard the Corroſion and Exulceration of the Annate and the Horny Tunicle, and ſo produce a white Spot, a Scar, or ſome ſuch blemiſh in the Sight.

X. In the Cure, the antecedent Cauſe is to be removed, as being that which nouriſhes the Containing; and the Original Cauſe is to be removed, that the Containing one may be the better diſcuſſed.

XI. The

XI. The Body is first to be Purged with one dram of *Pill. Cochiæ* or half an ounce of *Diaprunum, Electuary Solutive*, adding a few grains of *Diagridium*: or else such a Draught.

℞. *Rhubarb* ʒ j. ſ. *Leaves of Senna* ʒ iij. *Tartar* ʒ j. *Aniſe-ſeed* ʒ j. *Decoction of Barley* q. ſ. *Infuſe them, and then add to the ſtraining Solutive Diaprunum Electuary* ʒ iij.

XII. The Body being Purged, open a Vein in the Arm, and take away eight or ten ounces of Blood. Then Purge again, and if need be bleed again.

XIII. To divert the Excrementitious Humors from the Brain to the Eyes, Cupping-glaſſes may be applied to the Neck and Shoulders; or a Veſicatory behind the Ears. Which if they prove not ſufficiently effectual, make a Seaton in the Neck, or apply an Actual or Potential Cautery to the Arm or Neck.

XIV. To aſſwage the Pain, drop into the Eye the Blood of the Wing-feathers plucked from Young Chickens, or Womens Milk newly milked from the Breaſt; or the Muſcilage of the Seeds of Flea-wort, and Quinces extracted with Roſe-water; or the Yolk of an Egg boiled to a hardneſs, or elſe the following Cataplaſm laid upon the Eye.

℞. *Pulp of an Apple roaſted* ʒ j. ſ. *Crum of new White-bread* ʒ iij. *Saffron Powdred* ℈ j. ſ. *New Milk and Roſe-water equal Parts. Make them into a Cataplaſm.*

XV. The Pain being ſomewhat aſſwaged, this Collyrium may be dropped into the Eye.

℞. *Sarcocol fed with Milk* ʒ j. *Tragacanth.* ʒ ſ. *Muſcilage of the Seed of Quinces* q. ſ.

XVI. For diſcuſſion of the Humor contained in the Tunicle, foment the Eye with a Spung dipt in the following Fomentation warm.

℞. *Herbs, Althea, Fennel, Flowers of Camomil, Melilot, an.* M. j. *Water* q. ſ. *boil them to eight ounces; then add Roſe-water* ʒ iij.

XVII. After Fomentation lay on the Cataplaſm again, or elſe drop the following Collyrium into the Eye.

℞. *Aloes waſhed in Fennel-water* ℈ j. *Sarcocol ſteeped in Milk* ʒ j. *Saffron* gr. vij. *Eyebright and Fennel-water an.* ʒ j.

XVIII. Let him keep in a temperate and clear Air, free from Duſt and Wind and Smoak; let him avoid too much Light, and wear a green piece of Silk before his Eye. His Diet muſt be ſparing and of eaſie Digeſtion, condited with Fenel, Eyebright, Succory, Borage, *&c.* His Drink muſt be ſmall. Let him avoid Radiſhes, Onions, Cabbiges, Beans, Lentils, Olives, *&c.* The longer he ſleeps and the leſs Exerciſe he uſes, the better: and let him keep his Body open.

HISTORY. XVIII.

Of the Pin and Web, and Bloodſhot.

A Boy about twelve Years of Age of a cold Conſtitution, above five Months ſince perceived a dimneſs in both his Eyes, ſo that at firſt he thought he ſaw Gnats and Straws fly before his Eyes. Afterwards he ſeemed to look through a thick Miſt; and ſo his ſight began to fail more and more; ſo that he ſaw Men after a faſhion, but could not diſtinguiſh Faces; nay he could hardly diſtinguiſh a Horſe from a Cow. In the Apple of his Eye appeared a white ſpot, covering the Chriſtaline Humor, which yielded to the Finger if lay'd upon it.

I. THis Affection of the Eye is by the Phyſitians called *Suffuſio* or the Pin and Web, *which is an Obſtruction of the hole of the Uveus Tunicle, cauſed by a Humor preternaturally gathered and ſtaying between the Horny Tunicle and the ſight of the Eye, and hindring the Sight.*

II. This

II. This Humor in this Patient was Flegmatic, as appeared by the white colour in the Apple of the Eye: where it was collected by reaſon of the cold Temper of the Eye, not ſo able to concoct their Nouriſhmeut, but that ſome few thick Vapors exhale from the Uveous Tuncle, which are condenſed into a thick Humor by the External cold, in the ſpace between the Chryſtalline Humor, lying upon the Uveous hole, and the Horny Tunicle, and mixed with the watry Humor, and ſwim at the top in viſcous and thick Particles.

III. This Humor being thinner and leſs in quantity at the beginning, did not hinder the Ingreſs of the Beams into the Chriſtalline humor altogether, but only the thicker Particles of it, prevented all the Beams from entring in, which made the Patient think at firſt that Gnats and Straws hovered before his Eyes; which however were only the thicker Particles of the ſaid Humor; but the Humor afterwards becoming more plentiful and thicker, then the Sight lookt as it were through a Cloud; and as that thickneſs of the Humor increaſed, the Sight waxed dimmer and dimmer.

IV. The Cure of this Evil is very difficult, becauſe the Humor covering the Apple of the Eye, is now very much condenſed; and therefore the danger is, leaſt hardning into a little Skin it ſhould produce Blindneſs. But there is hopes of Cure while the Sight remains, and for that the Humor giving way to the Finger appears as yet not to be fixed.

V. In the Cure the Body muſt be Purged with *Pill. Lucis*, *Golden Pills* or *Chochiæ*: *Diaphœnicon*, *Hiera Picra*, *Diacarthamum*, or any draught compoſed of *Agaric*, *Turbith*, *Jallap*, *Senna* or the like.

VI. For the diſcuſſion of the cold humors, let the Patient Sweat twice a week with Treacle, Mithridate, Decoction of Saſſaparil, China, and Saſſafras. In the middle between whiles let him take Decoctions of Marjoram, Roſemary, Eyebright, Fennel, Betony, Rue, and the like: as alſo Cephalic Conditements of Conſerves of Anthos, Flowers of Sage, Eyebright, Betony, *&c.*

VII. To ſtrengthen the Head, let him make uſe of Cephalic Quilts. The Excrementitious humors are to be diverted from the Eye, and carry'd otherways off by Viſicatories applied behind the Ears, or an Iſſue in the Arm or Neck.

VIII. After theſe things Topics may be applied to the Eyes; and firſt ſuch a Decoction is to be prepared.

℞. *Roots of Radiſhes* ℥ ij. *Valerian* ℥ j. *Rue, Fennel, Eyebright, Lovage, Marjoram, Leaves of Laurel an.* M. j. *Flowers of Camomil* M. ij. *Seeds of Fennel, Caroways an.* ʒ ij. *Water* q. ſ. *Boil them to* ℔ j. ſ.

While it is boyling let the Patient ſit with his Eye over the ſteam of the Decoction: afterwards with a ſoft Spunge dipped in the ſame Decoction lukewarm, let him frequently and long foment his Eye, and obſerve this courſe for three weeks together.

IX. Let him then drop this Collyrium into his Eyes.

℞. *Juice of the bigger Celandine, Rue, Fennel, Hony-water an.* ℥ ſ.

When he has uſed this for ſome time, let him make it ſtronger by adding to it, the Gaul of a Patridge, and of a Pike one dram, and afterward one dram and a half

X. His Diet muſt be moderate hot, attenuating and diſcuſſing. His Sleep and Exerciſe moderate, and an open Body.

XI. If theſe avail not the Suffuſion muſt be taken from the Eye by the help of a Needle.

Of Bloodſhot.

A Plethoric Young Man playing in a Tennis-Court by misfortune, a Ball ſtrook him in the Left Eye: His Eye upon this aked to that degree that he could not hold open his Eye. The next day the Pain ceaſing, an extraordinary Bloody Redneſs was ſeen over his whole Eye without any Inflammation, and his Eye-lids ſeemed to be infected with the ſame Redneſs. But his Sight was no way damnified.

I. This

I. THis Malady of the Eye is called a *Suggillation* or Bloodſhot, *Being a pouring forth of the Blood without the Veſſels into the Tunicles over the Eyes and Eye-lids.*

II. This Blood flowed out of the ſmall Veſſels of the *Annate* Tunicle and the Eye-lids, broken and opened by the ſtroak of the Ball. For the Horny Tunicle was not hurt as appeared by the ſoundneſs of the Sight which was no way damnified.

III. There is no danger in this affection if it be taken in time, before the extravaſated Blood putrifie and inflame.

IV. Firſt the Body is to be Purged, and a Vein opened in the Arm. Then drop Womans Milk into the Eye, or Blood ſqueezed out of the Quills of live Chickens, and foment the Eyes frequently with this Fomentation.

℞. *Willow-leaves, Plantain, Flowers of Camomil, Melilot an.* M. j *Boil them in Water,* q. ſ. *Add to the ſtraining* Roſe-*water* ℥ j. ſ.

V. When there is no fear of a larger Efflux of Blood, let the Fomentation be only diſcuſſive.

HISTORY XIX.

Of Blindneſs.

A Perſon of forty Years of Age, ſtrong, but given to his Belly, after he had complained for ſometime of a ſlight giddineſs with a troubleſome heavineſs, at length his ſight in two days time was ſo decay'd, that he could hardly ſee, no not ſo much as the light, but became abſolutely Blind; and yet his Eyes did not ſeem to ail any thing. The Patient for ſome time was very temperate, but his blindneſs ſtill continued, though his heavineſs and Vertigo went off: and the reſt of his Body was well.

I. THis Malady is called *Cecitas* or blindneſs, which is a Deprivation of the Sight.

II. The Antecedent Cauſe of this Diſtemper is Flegm collected in the Ventricles of the Brain, which flowing thence to the Optic Nerves, and obſtructing them, hinders the Influx of the Animal Spirits to the Eye and the preception of viſible Objects.

III. This Flegm was generated out of the Crude and Flegmatic Vapors and Humors ariſing from too much gutling, and there thickned through the colder temper of the Part.

IV. By the ſame crude Vapors carried through the Carotides to the Choroid-Fold, and obſtructing the narrow paſſages of it, that firſt whirling paſſage of the Humors, and conſequently the Vertigo was cauſed; which was accompanied with a great Heavineſs cauſed by the thick and viſcous Humors, which Nature endeavors to evacuate through the Sieve-like Bone.

V. In the mean time the Eyes look very well, becauſe there is no Miſtemper nor vicious Conformation in them, and becauſe the Sight fails only for want of Animal Spirits, cauſed by obſtruction of the Optic Nerves.

VI. Theſe Nerves are obſtructed only at their beginning by the ſaid Flegmatic Humor which ſomewhat inſinuated it ſelf into the broader Pores of the beginning of the Pith.

VII. The Patient was afterwards freed from his Vertigo and Murr, becauſe he abſtained from his uſual Gormondizing: which produced in a ſtrong Body a better Concoction of the Crudities, which abated the anteceding Cauſe, and conſumed the containing Cauſe.

VIII. But the Blindneſs remained, becauſe the crude Humor, fixed in the Pores of the Nerves, as well in regard of their own Viſcoſity as the narrowneſs in the Pores of the Nerves, could neither be diſcuſſed nor conſumed. And though it be no longer ſupplied by the anteceding Cauſe, yet in reſpect of it ſelf and the Part to which it adheres, may remain and cauſe the obſtruction.

IX. This blindneſs is very difficult to be cured: becauſe the Humor ſticking in the Optic Nerves is not eaſily diſcuſſed. But becauſe the Diſtemper is of no long continuance, there is ſome hopes of Cure.

X. In

X. In the Cure, first the Body is to be Purged with these Pills.

℞. *Mass of Pill. Lucis, Cochiæ an.* ʒ ſ. *with a little Syrup of Stœchas. Make nine Pills.*

Instead of which may be given ʒ j. of Powder of Diaturbith with Rheon, or Rubarb.

XI. The next day take away a little Blood out of the Arm; and two or three days after Purge again.

XII. After that let him drink three times a day a draught of this Apozem.

℞. *Roots of Acorus, Valerian, Fennel, Elecampane an.* ʒ ſ. *Betony, Eyebright, Creeping-time, Marjoram, Rosemary, Laurel-leaves an.* M j. *Flowers of Camomil, Stœchas an.* M. ſ. *Seeds of Fennel, Caroways an.* ʒ ij. *Juniper-berries* ʒ ſ. *Raisins cleansed* ʒ ij. *Water* q. ſ. *Boil them for an Apozem of* ℔ j. ſ.

After this is drank off, it may be made Purging by adding,

℞. *Leaves of Senna* ʒ j. ſ. *Rubarb, white Agaric an.* ʒ ij. *Aniseed* ʒ iij. *Cinamon* ʒ j.

This let the Patient drink not above once aday.

XIII. The Body being sufficiently Purged, this Errhine may be conveniently put up into his Nose.

℞. *Juice of Marjoram, Fennel an.* ʒ ſ. *of Beets* ʒ j. ſ.

XIV. For diversion, apply Cupping-glasses to the Back and Scapulas; Visicatories may be also applied behind the Ears, or a Seaton or Issue made in the Neck.

XV. To dissipate the Remainders contained in the Brain of the Optic Nerves, and for the Corroboration of the Head, foment the Eyes, Forehead, top of the Head and Temples with this Fomentation.

℞. *Fennel, Marjoram, Rue, Rosmary, Betony, Eyebright, Flowers of Camomil, Melilot, Stœchas an.* M. j. *Seeds of Anise, Caroways, Lovage an.* ʒij. *Water* q. ſ. *Boil them to* ℔ ij. for a Fomentation.

XVI. After Fomentation lay on a Quilt of hot attenuating Cephalics; and into his Ears put little Tents dipped in Oyl of Fennel.

XVII. This done drop into the Eye such Colliryums as these.

℞. *Juice of Fennel* ʒ j. *Celandine and Rue an.* ʒ ſ.

Which may be made sharper by adding Juice of wild Radish three drams.

XVIII. Let his Diet be Food of easie digestion, Condited with Marjoram, Fennel, Betony, Rosemary, Eyebright, Fennel, Anise-seed and the like; Shunning Mustard, Garlic, Onions and the like. His drink small and clear. Let his Sleep and Exercise be moderate, and let him keep his Body open.

HISTORY XX.

Of thickness of Hearing and Noise in the Ears.

A Woman about thirty six Years of Age, of a Flegmatic Constitution, the Winter before had been often troubled with Catarrhs; from which however she was quite freed about the beginning of *Feburary*. But then for some few days she complained of a slight heavy pain in her Head; which in a short time went off; upon which ensued a very great noise in her Ears, with such a thickness of hearing that she could hardly hear the loudest bawling in her Ears; which thickness of hearing and noise continued for near three Months together. Otherwise she was well in Health, and her Monthly Customs came kindly down.

I. IN this Patient the Instrument of Hearing was affected in the lower Part.

II. The Malady was twofold, Thickness of Hearing and Noise in the Ears. *The one is defect and difficulty of Hearing, wherein only loud Noises moved by the External Objects are heard, soft Speaking is not at all perceived by the Sense of Hearing. This is a troublesom Sound between the*

the Ears themselves, excited by no external Object.

III. The Cause of the thickness of Hearing is a Flegmatic Humor lying toward the inner Parts of each Ear, and hindring a sufficient Influx of the Animal Spirits to the inner Parts of the Ear, partly by compressing the Acustic Nerve; partly by hindring the free Motion of the *Tympanum*. For hence it comes to pass, that gentle Noises hardly move the obstructed *Tympanum*, and the Air included within it; so that the Motion by them made for want of Spirits is not perceived, and consequently not communicated to the common Sensory. But loud sounds more strongly move the *Tympanum* and the Air included within it, but yet the Motion for want of Spirits, and by reason of the narrowness of the Acustic Nerve is perceived no otherwise then only as sleightly communicated to the common Sensory.

IV. The noise or singing in the Ears, is caused by the Vital Spirits passing the inner little Arteries of the Ears, and with their Motion moving also the neighbouring Air included within the inner Part of the Ear. Which motion, when it cannot be freely made by reason of the containing Place, being narrowed by the Flegm which lyes toward the inner Parts of the Ear: Hence it is that the moved Air continually strikes against the *Tympanum*, and being repercussed by that, offers it self to the common Sensory, like a singing or ringing Noise.

V. These Symptoms continued three Months, because the next Cause was fomented by the Flegmatic Temperature of the whole Body. 2. Because the Flegm sticking in that affected Part is hard to be discussed.

VI. The fear is least these Maladies may turn to absolute Deafness. For that the Flegmatic Humor may encrease, and upon the dissipation of the thinner Parts, thicken to that degree, that no Remedies will be able to attenuate and discuss it. But if the Cure be undertaken in time there is some hopes, because there is no distensive Pain, neither is the Hearing quite lost.

VII. The Body therefore must be Purged twice or thrice a week with *Cochiæ* Pills or Golden Pills, Powder of *Diaturbith*, Electuary of *Hiera* or *Diaturbith*; or Infusions of *Agaric*, *Diaturbith*, *Jallop*, or other Phlegmagogues.

VIII. To abate the Flegm of the whole Body, Decoctions of *Sassafras*, *Sassaperil* and *Guaiacum* are most proper, to which add hot Cephalics at the end of the Decoction. The Humors in the Ventricles of the Brain must be evacuated by Masticatories, Errhines and Sneezing. And to corroborate the Brain, proper Apozems and Cephalic Conditements must be prescribed.

IX. To dissipate the remainders in the Head and Parts affected, a Fomentation of hot and discussing Fomentations will be requisite, as Betony, Sage, Rosemary, Marjoram, Calamint, Thime, *&c.* the Head being often fomented with a large Sponge dipt therein. After which a Quilt of the same Cephalics will be no less proper.

X. Afterwards to attenuate and dissipate the Flegmatic Humors contained in the Organ of Sense, some such Decoction as this may be prepared.

℞. *Root of Wild Radish* ℥ iij. *Thime, Betony, Hyssop, Marjoram, Rosemary, creeping Thime, Lawrel-leaves, Flowers of Camomil, Melilot an.* M ſ. *Seeds of Caroways, Cummin, Lovage, Fennel, an.* ℥ ſ. *Water* q. ſ. *Boyl them according to Art.*

While they are Boiling he may receive into his Ear the steam of the Decoction through a Pipe placed in the Cover of the Pot, then let the Ears be fomented with Sponges dipt in the said Decoction: and after Fomentation put into the Ears, two Tents dipt in the Oil of Anise-seeds, Fennel or Caroways.

XI. This Cataplasm also laid upon the Ears in the Night time between two Linnen Cloaths may prove very effectual.

℞. *Marjoram, Sage, Flowers of Camomil, Melilot. an.* M. j *Seeds of Nasturtium, Cummin, Fennel an.* ℥ j. ſ. *Reduce them to Powder, and to the Powder, add Onions roasted under the Embers* N°. ij. *one midling Turnep roasted, Flower of Fengreek-seed* ℥ j *Water* q. ſ. *Let them boil a little while, and adding Oyl of Dill, of Bitter Almonds an.* ℥ j. *make a Cataplasm.*

XII. In the day time instead of this Cataplasm, let him lay warm to both Ears this little Bag.

℞. *Marjoram* M. j. *Rosemary, Flowers of Camomil an.* M. ſ. *Seeds of Cummin, Fennel, Caroways, Lovage an.* ℈ ij. *cut and beat these and put them into a silken Bag.*

XIII. If the uſe of theſe Remedies afford no eaſe, then make Iſſues in the Neck and Arms, to divert the flegmatic Matter from the Ears through other Paſſages.

XIV. Beware of Places expoſed much to the Wind, eſpecially the North. His Diet muſt be eaſie of Digeſtion, condited with Marjoram, Lawrel-leaves, Creeping Thyme, Roſemary, Betony, Carminative Seeds, or Seeds againſt Wind, Nutmeg, *&c.* His Drink ſmall. All Meats that fill the Head with Vapors muſt be avoided. Moderate Sleep and Exerciſe, and a ſoluble Belly.

HISTORY. XXI.

Of Bleeding at the Noſe, the Murr, and loſs of Smelling.

A Man about forty Years of Age, indifferent ſtrong, and abounding with Blood, ſometimes drinking over hard was for ſometime troubled with ſharp and ſalt Catarrhs falling down partly to his Noſtrils, partly to his Lungs and Chaps, which brought upon him a violent Cough, inſomuch, that while he was once Coughing very vehemently his Noſe fell a bleeding, nor could the bleeding be ſtopt for ſome hours: But that being ſtopped, and ſome Remedies given him for his cold and the Catarrh, within two days his Cough ceaſed; but then the bleeding returned by Intervals, eſpecially if the Patient ſtirred more then ordinary, and that in ſuch abundance, that his life was in danger.

I. THE Malady is Bleeding at the Noſe.

II. The Antecedent Cauſe is twofold. 1. Redundancy of Blood. 2. A ſharp Humor collected in the Head.

III. The Blood abounding in the whole Body being vehemently forced upward in great quantity by the violent Cough, and diſtending and opening the Veins and Arteries of the Noſe, in reſpect of it ſelf, becomes the containing Cauſe.

IV. Now the Blood was copiouſly, forced upward by the Cough, becauſe the deſcending Trunk of the *Aorta Arteria* was compreſſed and ſtreightned by the forcible Contraction of the Muſcles of the Breaſt and Abdomen, ſo that much leſs Blood could be thruſt forward through it from the Heart, which therefore was forced in greater quantity to the Head, through the aſcending Part of the ſaid Artery, and ſo it diſtends all the Veins and Arteries of the Head.

V. Now that diſtending Plenty opens ſome Veſſels in the Noſtrils ſooner than in any other Parts of the Head, becauſe they are there ſeated in a moiſt and tender Part, and cloathed with only a very ſoft and tender Skin.

VI. But becauſe ſharp and ſalt Catarrhs preceded, certain it is, that not only their Diſtenſion, but Corroſion opened ſome Veſſels in the Noſtrils. Otherwiſe had they been opened only by Diſtenſion, the Bleeding had not ſo often returned; which now returns, becauſe the Solution being made by Corroſion, could not be ſo ſoon conſolidated.

VII. If the Patient never ſo little overwalked or ſtirred himſelf, the Bleeding returned, becauſe that Motion heated, and more rapidly moved the Blood, which therefore flowing hotter, and in greater quantity to the Noſtrils, could not be held in by the Extremities of the Veſſels not yet well conſolidated; ſo that it forces its way out again.

VIII. This Returning Bleeding is ſomewhat dangerous, for fear too much loſs of Blood ſhould turn to a Syncope, or that thereby the Liver ſhould be over-cold and weakned, and thence a Cachexy or Dropſie enſue.

IX. In the Cure, Blood-letting in the Right-arm is firſt to be done, and a moderate quantity of Blood to be taken away, with reſpect to the ſtrength of the Perſon. The Belly is to be looſned with Rubarb mixed with Tamarinds, or a Gliſter.

X. In

X. In the time of Bleeding, clap cold Water or Oxymel to the Neck and Teſticles, and Cupping-glaſſes, with much Flame to the Legs and Feet.

XI. Tye to the Fore-head a Lock of Tow, with this Mixture.

℞. *Bole Armoniac, Terra Sigillata, Dragons Blood, red Coral, an.* ʒj. *Volatile Flower* ʒij. *White of one Egg, a little ſtrong Vinegar. Mix them.*

XII. Into the Noſtrils blow this Powder.

℞. *Trochiſchs of ſeal'd Earth, Bloodſtone, an.* ʒj. *Frankinſcence, red Coral, Dragons Blood. an.* ℈j.

Or elſe make long Tents, and being moiſtned in the White of an Egg, rowl them in this Powder, and ſo put them up into the Noſtrils. Or mix the ſame Powder with the White of an Egg like an Oyntment, and dip the Tents therein before you thruſt them up.

XIII. Simples alſo may be put up into the Noſtrils, as green Horſtail or ſhave Graſs, or Pimpernel or Plantain bruis'd, or Hogs or Aſſes Dung, and ſuch like, which are found by Experience to have wrought great Cures.

XIV. Nor are thoſe things to be neglected that benefit by an occult quality; to which purpoſe the Patient may wear the following Amulet about his Neck.

℞. *Powder of a dry'd Toad* ʒij. *Bloodſtone* ʒj. ſ. *Trochiſchs of Seal'd Earth, Moſs of human Skulls, an.* ʒj. *red Coral* ʒſ. *Cobwebs* ℈j. *Reduce them into Powder, and then make them into a Paſte, with Muſcilage of Tragacanth, or the white of an Egg, to be form'd into a flat Cake, and ſowed up in a ſilk Bag, and hanged about the Patients Neck.*

XV. While theſe things are doing, give him ſometimes a Draught of this Decoction.

℞. *Roots of Tormentil, greater Conſound, Snake-weed, an.* ʒvj. *Knotgraſs, Pimpernel, Plantain, Shepherds Purſe, Sanicle, Purſlain, an.* M. j. *red Roſes* M. ſ. *White Poppy Seed* ʒv. *Seeds of Quinces and Lettice, an.* ʒj. ſ. *Raiſins of the Sun* ʒij. *Water* q. ſ. *Boil them into an Apozem of* ℔j. ſ. *to which add Syrup of Quinces and Sowre Pomegranates, an.* ʒj. ſ.

XVI. Now and then let him take a ſmall quantity of this Conditement.

℞. *Trochiſchs of ſeal'd Earth* ℈ij. *Pulp of Quinces, Conſerve of red Roſes, an.* ʒvj. *Syrup of Poppy, Rheas* q. ſ.

XVII. If theſe things will not ſtay the Bleeding, clap a Cupping-glaſs with much Flame to both Hypochondriums, without Scarification. Or elſe give him fourteen Grains of the Maſs of *Pill. de Cynogloſſa*, or Hounds-tongue, reduced into three Pills. Or elſe this Amygdalate.

℞. *Sweet Almonds peel'd* ʒj. *The four greater Cold Seeds* ʒj. *White Poppy Seed* ʒiij. *Decoction of Barley* q. ſ. *Make an Emulſion of* ℔ſ. *To which add Syrup of Poppy* ʒj. ſ. *Sugar* q. ſ. *Mix them for two Doſes.*

XVIII. Avoid a cold and dry Air, and a very light Being. Obſerve a cooling and thickning Diet, and drink ſmall Drink. Abſtain from Exerciſe, nor cover the Body too hot, ſleep long, and keep the Belly Soluble.

HISTORY X.

Of the Poſe or Murr, and Loſs of Smelling.

A Gentleman, about thirty years of Age, was wont to ſnuff up Powder of Tobacco into his Noſtrils, which cauſed him to ſneeze. At length, being taken with the Poſe or Murr, yet he continued his Powder of Tobacco, which he took three or four times a day, which made him void a great quantity of flegmatic Humors, through his Noſtrils and Palate; however, his Murr encreaſed to that degree, that he quite loſt his Senſe of Smelling. And then his Sneezing brought away little or no Matter.

I. THis Gentleman loſt his Smell by reaſon of that Poſe, which is a cold and flegmatic Diſtillation from the Ventricles of the Brain, and falling into the *Ethmoides* Bone, and the Membranes belonging to it.

II. This flegmatic Matter, by reaſon of the Gentlemans frequent Sneezing and Contractions of the Membranes of the Brain, and conſequently the ſtreightnings of the Pores, and Detentions of the Vapors was copiouſly collected in the Ventricles of the Brain, and expelled down to the Ethmoides Bone. The diminutive Holes of which, when it was not able to paſs, it ſo obſtructed, that no Odor could come to the inner Parts of the Noſtrils, which cauſed the Loſs of the Smell.

III. Becauſe this Poſe which hinders the Smell continued long, the Cure proves the more difficult.

IV. After due Evacuation of the Body, care is to be taken of the Head, which is to be corroborated with hot Cephalics given in Apozems, Conditements, Powders, *&c.* the better to attenuate and diſcuſs the Vapors, aſcending thither.

V. To open the Pores, Frictions of the Head, and Fomentations, with hot and opening cephalic Decoctions. After which, put on a dry Quilt of the ſame Cephalics upon the Head of the Party.

VI. Put up into the Noſtrils, ſuch things as are proper to cut and attenuate thick Humors, as Camphire, Vinegar of Squills, and Root of wild Radiſh bruiſed.

VII. Let him continue the Uſe of theſe things for ſome time, which if they prove ineffectual, the only way will be to make an Iſſue in the Neck.

VIII. Let his Food and Drink be condited and intermixed with hot Cephalics, and let him feed ſparingly. Let his Sleep and Exerciſe be moderate, and let him be ſure to keep his Body open.

HISTORY XXII.

Of the Tooth-Ach.

A Young Lad, about fifteen years of age, of a flegmatic Temper, having, after hard Exerciſe, expoſed himſelf bare-headed to the cold Air and the Wind, was taken with a moſt terrible Pain in his Teeth, upon the Left-ſide, which extended it ſelf to the innermoſt and upper Parts of the Head. There was no Swelling in the Gums of the the out-ſide of the Cheek, no Redneſs or Inflammation; only out of one of his Hollow Grinders he felt a certain ſerous, ſalt, ſharp Humor diſtil as cold as Ice.

I. THis Malady is by the Phyſicians called *Odontalgia*, or the *Tooth-ach.*

II. The anteceding Cauſe was flegmatic and cold Humors gathered in the Body, which by the Heat of Exerciſe being attenuated into Vapors, and carried to the Head, and there not only detained by the External Cold ſhutting up the Pores, but alſo being condenſed into a ſerous, ſalt and ſharp Liquor, and not able to paſs through the Paſſages appointed for the Evacuation of the Excrements of the Brain, fell upon the Jaw-teeth on the Left-ſide, and there cauſed a moſt cruel Pain.

III. That this is a ſalt, ſerous, cold Humor, the Patient himſelf finds by the Taſte of the Drops that diſtil out of his Teeth into his Mouth.

IV. The Pain proceeds from hence, becauſe the little Nerve inſerted into the Cavity of each grinding Tooth, together with the *Perioſtium* that ſurrounds every Cavity, is corroded by the ſharp Humor, and vexed by the extraordinary Cold of it.

V. The Pain extends it ſelf upward to the inner parts of the Head, becauſe the little Nerves of the Teeth, inſerted in the Cavities, are Branches of the third and ſixth Pair. No wonder then

that

that thoſe Nerves being grieved, carry the Pain to the inner Parts of the Head; beſides that, 'tis very probable that that ſame ſharp and ſalt Humor falls down to the Teeth all the whole length of thoſe Nerves, through the Holes of the *Cranium*, from whence thoſe Nerves iſſue forth, and ſo not only the Particles which are inſerted into the Roots of the Teeth, but the whole Nerves from the *Cranium* to the Teeth, are infeſted with that Humor.

VI. There was no Tumor in the outer Part of the Jaw, becauſe the Humor which cauſed the Flux, did not abound in quantity, but was only ſharp, and very little. Nor was there any Swelling in the Gums, becauſe the Humor did not ſtay therein, but iſſued out from the hollow grinding Teeth.

VII. Neither was there any Redneſs or Inflammation in the Gums or Jaw; for though the Humor were ſharp, yet it was actually and potentially cold, ſo that it could not breed any Inflammation or hot Diſtemper.

VIII. This Pain is not to be contemned, for that being ſo terrible as it is, and cauſing continual want of Sleep, and Commotion of the Humors and Spirits, it may produce Deliriums, Convulſions, and continual Fevers.

IX. In the Cure, the Anteceding Cauſe is to be taken away, then the Containing and the Original is to be removed, the Pain to be aſſwaged, and the Head to be corroborated.

X. Let the Body be purged with one Dram of Powder of Diaturbith, or Diacarthamum, or with theſe Pills.

℞. *Maſs of Pill. Cochiæ, Golden Pills, an.* ℈j. *Diagridium* gr. iiij. *with Syrup of Stœchas, Make up* vij. *Pills.*

XI. To evacuate the Humor contained in the Ventricles of the Brain, make uſe of this Errhine.

℞. *Juice of Mercury, Marjoram, an.* ℥ſ. *of Beets* ℥j. ſ.

Or elſe inſtead of this, take the following Sternutory.

℞. *Roots of Pellitory, White Hellebore, Leaves of Marjoram, an.* ℈j. *black Pepper* gr. v. *For a Powder.*

XII. To ſtrengthen the Head, open the Pores, and diſſipate the cold Humor, prepare this Quilt.

℞. *Leaves of Roſemary, Marjoram, Sage, an.* M. ſ. *Flowers of Lavender, Melilot, red Roſes, an. one ſmall Handful; Nutmegs, Cloves, an.* ℈j. *Frankincenſe, Maſtich, an.* ℥j. *Beat them into a groſs Powder for a ſilken Cap.*

XIII. Alſo lay this Plaiſter upon both Temples.

℞. *Frankincenſe, Maſtich, an.* ℈j. *Sagapen, Tacamahacca, an.* ℈j. ſ. *Mix them and ſpread them upon black Silk.*

Nor will it be amiſs to make uſe of Conditements and Cephalic Apozems of Marjoram, Roſemary, Sage, Betony, Conſerves of Anthos, Sage, *&c.* Tobacco alſo taken in a Pipe is an excellent Remedy.

XIV. Let the Patient alſo frequently waſh his Mouth with this Decoction warm.

℞. *Root of ſharp pointed Dock* ℥j. *Male Piony* ℥ſ. *Marjoram, Sage, Hyſſop, Thyme, Betony, Roſemary, an.* M. j. *Fennel and Aniſeed, an.* ℥ij. *Wine* q. ſ. *Boil them to* ℔j.

XV. After he has waſhed his Mouth, let him put into the Hollow of the Tooth with a little Cotton, one Drop of Oyl of Baſil or Cloves. In extremity of Pain, a little Spirit of Wine may be held in the Mouth to the Teeth affected. But this is not to be done often, for fear of hurting the Lungs.

XVI. To divert the Humor, apply a Veſicatory behind the Ear, or in the Neck, and keep it open for ſome time.

XVII. Theſe Remedies not availing in extremity of Pain, give the Patient toward Evening three grains of *Opiate Laudanum* in a Pill, or thirteen grains of the Maſs of *Cynogloſs* Pills, or two or three Scruples of *Philonium Romanum.*

XVIII. Let his Diet be condited with hot Cephalics, avoiding all ſalt, ſharp and acid Diet, that fill the Head with Vapors. Let his Drink be ſmall: Let him ſleep long, exerciſe moderately, and keep his Body open.

HISTORY. XXIII.

Of thoſe Tumors in the Mouth called Aphtæ.

A Woman of about thirty years of Age was taken with a continued Fever, accompanied with an extraordinary Faintneſs; yet without any vehement Heat or great Thirſt, which in two days had brought her extreamly low. Her Pulſe beat ſlow and unequal: Her Urine was like that of a Man in perfect Health. So that ſhe complained of no exceſſive Pain in any Part, but of an extraordinary Weakneſs of her whole Body, which was ſuch that ſhe could not ſit upright in her Bed. The fourth Day, ſhe perceived a Difficulty to Swallow, ſo that her Drink would not go down her Throat and Gullet without Pain, Trouble and Impediment. At the ſame time her Palate, Gums, Tongue and Chaps were full of little white Puſtles without number. Her Taſte was alſo ſo far gone, that ſhe reliſhed nothing that ſhe eat.

I. THis Woman was ſeized with a Malignant Fever, accompanied with *Aphtæ, which are certain Exulcerations in the upper part of the Mouth, with an extraordinary Heat.*

II. The Anteceding Cauſe were putrid Humors, ſharp and malignant, contained in the Body, which being attenuated by the feveriſh Heat, and carried through the Arteries and occult Paſſages to the Mouth, and cauſing an Exulceration therein, conſtitute the next Cauſe.

III. That theſe Puſtles proceed from a certain malignant putrid Humor, is plain from the putrid malignant Fever, preceding and joyned with them. The Malignity of which, appeared by the Faintneſs and Decay of Strength which the Patient endured, whereas a Fever ſeems to ſhew no ſuch manifeſt Cauſes of ſo much Weakneſs. Then again, that it was a flegmatic Humor, appeared by the leſſer Heat of the Fever, and the whiteneſs of the Puſtles.

IV. This Humor, attenuated by the Fever, and coming ſharp to the Mouth, exulcerated the inner, rather than the other Parts, as the Palate, Tongue, Gums, *&c.* becauſe they are cloathed with only a thin and ſoft Pellicle, which are eaſily exulcerated by ſharp and putrid Humors, whereas the former Parts more eaſily reſiſt the Corruption.

V. Now becauſe that Pellicle which covers the inner Parts of the Mouth, extends it ſelf through the Jaws and Gullet to the Stomach. Hence alſo the Gullet was beſet with the ſame Puſtles, which cauſed that Difficulty of Swallowing, and painful going down of the Drink.

VI. Her Taſte was loſt, becauſe the inner Pellicle of the Mouth, into which the Guſtatory Nerves are inſerted, and by means of which, the Taſte happens, was ſo full of thoſe little Ulcers, that the Guſtable Objects could not come to it. Beſides that, the Tongue being grieved by the Ulcers, and infected with bad Humors, could not well judge of Savors.

VII. Theſe Puſtles are more a Sign, than a Cauſe of danger. For they indicate a malignant and dangerous Fever, upon the Cure of which, their Cure depends.

VIII. The Body therefore being well purged, and Blood being taken away, and other convenient Remedies adminiſtred, the Mouth of the Patient muſt be gargarized with this Decoction.

℞. *Barley cleanſed, Roots of Snakeweed, Tormentil, an.* ℥ſ. *Licorice ſliced* ʒiij. *Plantain, Purſlain, Knot-graſs, Oak-leaves, an.* M.j. *Flowers of Mallows, red Roſes, Pomegranates, an.* M.ſ. *Water* q.ſ. *Make a Decoction to* ℔j. *Add Syrup of Mulberries and Dianucum, an.* ℥j.ſ. *Mix them for a Gargle.*

IX. After ſhe has well gargled her Mouth,

Mouth, let her lick and waſh the inſide of her Mouth with this Syrup.

℞. *Syrup of Quinces, ſowre Pomegranates and dry Roſes, an.* ℥j.

X. If the Pain grow ſharper, let her hold new Milk in her Mouth, or rather Whey, and change it often. Then let her lick Syrup of Quinces, or dry Roſes alone, and rowl her Tongue about her Mouth, eſpecially when the Puſtles are broken.

XI. Let her Diet be refrigerating, and ſuch as reſiſts Putrefaction; her Drink ſmall, or elſe Ptiſans, and let her be ſure to keep her Body ſoluble.

HISTORY II.

Of the Aphtæ Puſtles.

AN Infant of two months old, when the Mothers Milk failed, was put to a Nurſe of a choleric Temper, but otherwiſe healthy and abounding with Blood and Milk. After the Infant had ſuckt this Woman eight days it began to vomit up curdled Milk mixed with choleric and flegmatic Humors, ſlept unquietly, and voided much yellow and green Excrement. At laſt, the Mouth of it was full of white Puſtles, ſo that through Pain it could ſuck no longer, though it ſeemed very deſirous of the Breaſt. In the mean time there was no manifeſt Fever nor alteration of the Pulſe.

I. THE Cauſe of theſe Puſtles was the Nurſes ſerous, hot and ſharp Milk, which the weak Stomach of the Infant could not well concoct, but bred much Choler; from which ſharp Vapors aſcending to the Mouth, exulcerated the tender Pellicles of the Inner Part of the Mouth.

II. That there was a great quantity of Choler, was apparent from the yellow and green Colour of the Excrements.

III. The Milk was curdled in the Stomach by reaſon of the Acrimony of the Choler, and the Crudities there bred. It was vomited up curdled, becauſe Nature being oppreſs'd with that and other crude Humors, and provoked by the Acrimony, endeavoured as much as it could, to caſt of that Moleſtation by vomiting.

IV. There was no Fever, becauſe the Choler was not yet corrupted, nor was carried to the *Vena Cava*, but as yet was voided ſufficiently upwards and downwards.

V. The Infant could ſuck no longer, becauſe the Pain of the Puſtles was exaſperated by ſucking. But it deſired the Breaſt to allay the Heat of the Mouth, with the Moiſture of the Milk.

VI. Theſe Aphties newly come, and without a Fever, are eaſily cured; but being delayed, there may be danger of a more deep and fatal Exulceration, and that a Flux of the Belly and Fever will enſue upon Corruption of the Choler.

VII. In the Cure, the Nurſe is chiefly to be conſidered, who by reaſon of her choleric Conſtitution, breeds ſharper Milk than the Infant is able to concoct. Then the Infant it ſelf is to be conſidered.

VIII. Therefore the Nurſe is to be purged more than once or twice with Choler-purging Medicaments; next to be let Blood. And ſome refrigerating Apozem to be given her of Succory, Endive, Lettice, Borage, Sorrel, Tamarinds, the four greater Cold ſeeds and the like. Alſo ſteep three drams of Rhubarb ty'd up in a linnen Rag in a pint of ſmall Ale, and let her drink it twice or thrice a Week, which will not only purge her, but the Child.

IX. Let her Meat be condited with Barley cleanſed, Endive, Lettice, Aſparagus, Pomecitrons, Cherries, red Currants, *&c.* Let her forbear Onions, Radiſhes, Muſtard, Spices, and all hot things, as Honey and Sugar. Her Drink muſt alſo be ſmall, avoiding Wine, Mead, and all hot and windy Drinks.

X. Waſh the Infants Mouth often with Syrup of Mulberries and Quinces; or of dry Roſes, or ſower Pomegranates, *&c.* Alſo give it in a Spoon ſome thin Broth,

Broth or Panada wherein Currans have been boiled till they break, with a little Sugar.

XI. If theſe things avail not, the Nurſe muſt be changed, and one more proper for the Conſtitution of the Infant muſt be ſought out.

HISTORY XXIV.

Of the Tumor breeding under the Tongue called Ranula.

A Woman about thirty years of age, accuſtomed to feed upon a flegmatic Diet, complained of a great Impediment in her Speech; otherwiſe every way healthy. Under her Tongue appeared a ſoft, looſe, indolent Tumor, of the ſame Colour with the Membranes under the Tongue, full of Blackiſh Veins, manifeſtly diſtinguiſhed at the String of the Tongue into the Right and Left Part, on both ſides about the bigneſs of a Nutmeg, and riſing in height above the Teeth, and by filling the Mouth, forcing up the Tongue to the Palate, and ſo not only hindring the Speech, but incommoding the Act of Swallowing. This Tumor, at firſt no bigger than a Tare, grew bigger and bigger every day; ſo that in three or four weeks it ſwelled to the bigneſs aforeſaid; and the Patient, not without reaſon, was afraid of a Suffocation.

I. THis Diſeaſe, by the Greeks is called Βάτραχος, by the Latins, *Ranula*; either becauſe it ſomewhat reſembles a Frog; or rather becauſe they that are troubled with it, inſtead of ſpeaking, are forced to croak like Frogs.

II. This Ranula *is a ſoft and looſe Tumor gathered under the Tongue, and divided at the Bridle of the Tongue into a Right and Left Part.*

III. The Extremities of the Salival Channels lying hid under the Tongue, are affected in this Diſtemper, which, together with the Membrane of the Tongue that reſts upon them, are diſtended by the Spittle or thicker Slime, and hence become ſo big.

IV. Now why they ſwell'd in this Woman more now than at other times, was becauſe of the cooling Aliments to which ſhe had long accuſtomed her ſelf, which had bred a more copious crude and viſcous Flegm, which partly falling upon the Salival Channels, and not being able to paſs the Pores of the Frog-reſembling Kernels, augmented within them, and diſtending them with it abundance, formed a ſoft Swelling, as it were cohering into two Bladders, and diſtinguiſhed by the Bridle of the Tongue.

V. Without doubt this Tumor was not a little augmented, becauſe the extream Pores of thoſe Channels and Kernels were alſo obſtructed by ſome external Cauſe, as waſhing the Mouth with cold Water, or aſtringent Meats and Drinks, by which means the Spittle had not free Paſſage.

VI. The Humor was ſoft and looſe, by reaſon of the Humor contained therein. Indolent, becauſe it lies in a moiſt Part; where, by reaſon of the ſmall quantity of Nerves which it receives, the Feeling is very obtuſe. It is of the ſame Colour with the reſt of the Membranes, becauſe there is no Inflammation to dye it of another Colour: And it was augmented in a ſmall time, becauſe the Paſſage of the Salival Slime was obſtructed.

VII. The Danger of this Diſtemper is not great, if taken in time; otherwiſe there may be ſome fear of a Suffocation.

VIII. Such a Patient muſt be purged every fifth or ſixth day with *Pill. Cochiæ* or Golden Pills, *Diaphœnicon*, *Hiera Picra*, *Diacarthamum*, Infuſion of *Agaric*, or any other Flegm purging Medicine.

IX. To abate the quantity of Flegm, and hinder the Generation of it, between the days of purging, Apozems of the Roots of Elecampane, Acorus, Calamint,

lamint, Fennel, Thyme, Roſemary, Marjoram, Hyſſop, Wind-expelling Seeds, *&c.* and Conditments and Powders of the ſame to ſtrengthen the Bowels.

X. And at the ſame time Topics may be applied to cut and attenuate the viſcous Humor, and open the Pores of the Salival Channels.

XI. The Patient alſo may waſh her Mouth with this Decoction.

℞. *Hyſſop, Calamint, Marjoram, Flowers of Camomil, an.* M. j. *Aniſe and Fennel-ſeed* ʒiij. *White-wine* q. ſ. *Boil them to* lbj. *To the Straining add Syrup of Hore hound and Hyſſop, an.* ʒvj.

XII. After waſhing, let the *Ranulæ* be rubbed with this Powder.

℞. *Dry Hyſſop, Common Salt, an.* ʒij. *Calamint, and Root of Elecampane, an.* ʒj. *for a Powder.*

XIII. If theſe things will not diſcuſs the Tumor, it muſt be Chyrurgions Work to cut the Tumor athwart with a deep Inciſion, and bring out the Matter therein contained, and then to waſh the Mouth with the aforeſaid Water or ſome other Aſtringent, wherein you may mix a little Alum.

XIV. If after Conſolidation of the Wound, the Tumor return again, then make a Croſs-like Inciſion upon the Superficies, without hurting the inner Membrane, and ſeparating the upper Pellicle that lies upon it, lay bare the whole Veſicle on both ſides the Bridle of the Tongue, and cut it out as deep as may be, and then cloſe up the Wound. Otherwiſe you may take away the Veſicle by a potential or actual Cautery. Neither is there any danger of any Damage to the Mouth, though the Salival Channels be ſtopped up by this Cure; for Experience tells us, that the Spittle finds other Channels and Paſſages for the moiſtning the Mouth.

The Diet is the ſame as in other flegmatic Diſeaſes.

Now becauſe I do here aſſert a new Cauſe of the *Ranulæ*, and another part to be affected, than other Phyſicians do, and mention alſo the Salival Channels, I think it neceſſary to tell what thoſe Channels are.

Theſe Channels were unknown, till of late found out in *England* by Doctor *Wharton* and *Gliſſon*, and laſt Winter publickly ſhown at the Anatomy Theatre at *Leyden*, by Doctor *John ab Horn*.

The Subſtance of them is much like the Veins, but ſtronger. They are two in number, and ſo wide in a Man, as to admit an ordinary Bodkin.

They riſe with a broad Beginning from the great and remarkable Kernel, aboye the middle Tendon, ſeated between the Fleſh of the Digaſtric Muſcle. And hence carried upward about the middle of the Cheek, they abſcond themſelves between two ſmall Kernels there ſeated, which when they have paſt, they are carried with a ſtreight Channel along the Nerve of the ſeventh Pair, which they cut like a St. *Andrews Croſs*, and ſo ſomewhat toward the Fore-parts, near the Bridle of the Tongue, they terminate and open into two peculiar Kernels, covered with a thin and porous little Membrane, which are ſeated under the Tongue, near the Frog-like Veins, between the Fleſh that joyns the Tongue to the neighbouring Parts, and the Kernels that lye under the bottom of the Tongue.

Their Office is to powre the Salival Moiſture into the Frog-like Kernels, which in them is contained as in a Sponge, and emptied into the Mouth through the broad Pores of the Membrane that covers them, for the moiſtning of the Tongue and Mouth.

HISTORY XXV.

Of the Hydrocephalus, or Watry Tumor of the Head.

A Little Boy, about a year and a half old, having been weaned six months, and by his Parents, that were very poor, fed with raw Whey, Fruit and other bad Nourishment, nor keeping his Head sufficiently warm in the Winter, within a short time had the hairy Part of his Head and Fore-head swelled out to his very Eyes. Which Tumor, in a months space, increased to that degree, that his Head was as big as a Mans Head, and yet his Face was not swelled; the Tumor was soft and white, and the deep Prints of the Finger might for some time be seen in it. The Child eat and drank indifferent well, he had no Fever, but was sleepy, and moved the Members of his whole Body but dully and faintly. His Nostrils were drier than usual, and he spit but little. He was loose, and voided much Urine.

I. THis Childs Disease, by the Physicians is called Hydrocephalus, which is a Swelling of the Head caused by a Collection of serous Humors.

II. This serous and flegmatic Humor is collected within the *Cranium*, and lies hid under the Skin, which is discerned by the Touch; there being only a soft Tumor.

III. That it is a serous and flegmatic Humor, appears by the white Colour of the Skin, and copious, because it yields to compression without pain.

IV. The anteceding Cause are cold and most Humors in the whole Body, which being raised beyond the *Cranium*, and condensed under the Skin, constitute the containing Cause.

V. These Humors are generated, partly through bad Diet, partly through the cold and moist Constitution of the Body; which weakens the Concoctions of the Bowels, and causes the breeding of many flegmatic and serous Humors, which being carried to the Head, are there attenuated into thick Vapors, and gathered together till they come to a copious Body.

VI. These Humors cannot be evacuated through the Nostrils and Palate, because their thickness has obstructed those Passages. Nor can they pass through the streightned Pores of the Skin, as being streightned by the External Cold, so that new Humors increasing every day, and none being evacuated, thence hapned such a Swelling in a Months space.

VII. However the Child fed, because his Stomach was not yet loaded with this excrementitious Flegm, as being copiously evacuated downwards by Urine and Stool.

VIII. He had no Fever, because the Humors were not putrified, nor was there any Malignity or Excess of Heat.

IX. He was sleepy, because of the cold and moist Temper of the Brain, which renders the Nerves of the Sensory languid and unfit for the Passage and Reception of the Animal Spirits; besides that, fewer Animal Spirits are generated, in regard the vital Spirits cannot pass the streightned Arteries of the Choroid Fold. Which Scarcity of Animal Spirits causes him also to move the Members dully and languidly as he did.

X. His Belly was soluble, by reason of the great quantity of serous and flegmatic Humors, that flow'd down to the Intestines; the thinner Part of which being mixed with the Blood, and separated from it in the Reins, causes a greater abundance of Urine.

XI. This Disease is dangerous in tender Age that will not bear strong Remedies, in regard of the ill Temper of the Head, the great Cachexy of the whole Body, and the Quantity of the Humor.

In the Cure, the serous and flegmatic Humor collected in the Head, is chiefly to be gently evacuated, the Bowels to be strengthened, and the Generation of the Mistemper for the future to be prevented.

XIII. First, give the Child in a Spoon, an ounce of laxative Syrrup of Succory with

with five or ſix grains of Jallop in Powder, or give him to Eat five or ſix drams of Solutive Currans. Then give him a little old Treacle, and if you can let him Sweat, alſo give him every day a little Conſerve of *Anthos*, Balm, or Flowers of Sage.

XIV. This done foment his Head with the following Fomentation warm.

℞. *Betony, Roſemary, Baſil, Thime, Flowers of Camomil, Melilot, Stœchas, an.* M j. *Leaves of Lawrel* M. ſ. *Seeds of Aniſe, Fennel, Cummin an.* ʒ ij. *White-Wine* q. ſ. Boil *them to* ℔ ij. *For a Fomentation with a large Spunge taking Care not to let it cool.*

XV. The Tumor being diſſipated by the uſe of this Fomentation, to remove the other Diſtemper, anoint the Head Morning and Evening with this Oyntment hot.

℞. *Oyl of Camomil, Alabaſtrin Ointment an.* ʒ j. *Oyl of Nutmegs preſſed* ϑ iiij. *Powder of Caſtor, Storax, Benjamin, an.* ϑ j. *Mix them for an Oyntment.*

XVI. After anointing, put on the following Quilted Cap.

℞. *Leaves of Roſemary, Marjoram, Flowers of Camomil, Melilot, an.* M. ſ. *Benjamin, Cloves, Nutmeg an.* ϑ j. ſ. *Beat them for a groſs Powder, to be ſowed into a Silken quilted Cap.*

And let him wear this Quilted Cap for ſome time.

XVII. In the mean time to Corroborate the Bowels twice or thrice a day, let him take a Spoonful of this Mixture.

℞. *Tylet-Flowers-water, Lilly of the Valleys an.* ʒ ij. *Cinnamon water* ʒvj. *Syrup of Stœchas* ʒ j.

Or inſtead of this, let him now and then drink a little Hydromel. And to the Region of the Stomach, Liver and Spleen, apply this Liniment.

℞. *Oyl of Lawrel, Camomil, Martiate Oyntment an.* ʒ ſ. *Oyl of Nutmegs preſſed* ʒ j. ſ.

XVIII. If theſe things avail not, in three or four the moſt ſwelled places of the Head, make a ſmall Perforation in the Skin, with a little Lance, no wider then is uſual in Blood-letting, that the *Serum* may diſtill by degrees through thoſe little holes, which is to be dried up with warm Rags, till it ceaſes to flow: then lay the afore mentioned Quilt.

XIX. Theſe Children muſt have drier Diet then ordinary; as Biſcuit maſticated. Little bits of White-bread moiſtened in the Decoction of Raiſins, or Hen-broath and ſweetened with a little Cinnamon or Sugar. Let him have thin Broths made with Wheat-flowre and Decoction of Raiſins, to which add a little Wine. Let him often drink Almond-Milk with a little Cinnamon-water. Let him abſtain from Sowre Milk, Whey, Ale, Fruit, unleſs now and then a Baked Apple or Pear: Let him ſleep moderately, and keep his Body ſoluble and regular in his Evacuations.

THE CURES OF THE Chief Diſeaſes Of the whole CHEST WITH TEN CASES OF THE PATIENTS.

HISTORY. I.

Of the Pleuriſie.

A Young Gentleman of twenty four Years of Age, having overheated himſelf in the Tennis-Court, and being very dry, drank a large Draught of cold Ale. Upon this he felt a Pain in the left ſide of his Cheſt, which within half an hour grew ſo acute, that through the trouble and the intolerable Pain, he could hardly breath. At the ſame time he had a ſtrong Fever and a dry Cough, which very much exaſperated the Pain. But neither his Faintneſs nor his Thirſt was very great.

I. VArious Parts were affected in this Patient, the *Pleura* Membrane, the Muſcles of the *Miſopleuron*, and the Heart, and conſequently the whole Body.

II. The Diſeaſes called the Pleuriſie, which is an Inflammation of the *Pleura* Membrane, and the Muſcles of the *Meſopleuron*, accompanied with a Pricking Pain in the Side, difficulty of Breathing and a continued Fever.

III. That it is a Diſeaſe appears by the pricking Pain, difficulty of Breathing and the continued Fever. that it is no Inflammation

Inflammation of the Lungs, the pricking Pain declares, which never is felt in that Diſtemper. That it is no Tumor, Inflammation or other Pain in the Spleen, appears from the ſharpneſs of the Pain above the *Diaphragma* toward the Arm-pits, and the difficulty of Breathing.

IV. The anteceding Cauſe was the great quantity of Blood in the Body. The Original Cauſes, vehement Exerciſes, and pouring down cold Ale juſt after it. The containing Cauſe is the over-large quantity of Blood contained in the *Pleura* Membrane and the *Meſopleuron* Muſcles, inflamed and corrupted.

V. The whole Body was over-heated by Exerciſe, whence a ſtrong and ſwift Pulſe of the Heart, which attenuating the Blood, forced it in great quantity to all the Parts, which ſo long as it had a free return through the Veins, never occaſioned any trouble. But being thickened by the cold Ale in the Veins of the Left ſide of the *Pleura*, and the Veins themſelves thereby contracted, it came to paſs that more paſt through the Arteries then could circulate through the Veins, which cauſed that accumulation of Blood that bred that Tumor in the *Pleura*: and becauſe the Blood that flows from the Heart, has its own heat, thence, with the increaſe of the Blood the heat encreaſed, and thence the Inflammation, which cauſed the Putrefaction, Part of which putrifying Blood being carried through the Intercoſtal Veins to the hollow Vein, and ſo to the Heart, cauſed the continued Fever, which however is only Symtomatical, as only ariſing from the Putrifaction of the Inflamed Part, poured fourth into the larger Veſſels.

VI. Now in regard the Ribs muſt be dilated in Reſpiration; but by reaſon of the Tumid Inflammation, of the diſtention of the *Pleura* Membrane and *Meſopleuron* Muſcles, they can hardly be dilated, thence difficulty of Breathing, which is the more troubleſome, becauſe the *Pleura*, being ended with a moſt acute Senſe can endure no farther diſtention. So that the Patient to avoid the Pain breaths ſlowly, which not being enough to cool the Lungs, cauſes a Drought of the Chaps and Mouth.

VII. Sharp Vapors exhaling from the inflamed Part, infeſt the neighbouring Lungs, and by their vellicating the *Aſpera*, *Arteria* cauſe a dry Cough.

VIII. This Diſeaſe is dangerous in regard the Heart is affected, and Reſpiration is impeded: beſides the fear of an Impoſthume in the Breaſt.

IX. In the proſecution of the Cure, Blood-letting is firſt to be done in both Arms, and the Patient muſt bleed freely. And if the firſt bleeding do not relieve the Patient, it is to be again repeated within an hour or two, after a third time if need require, with regard to the ſtrength of the Patient: though a ſmall debilitation is not to be feared.

X. In the mean time his Belly muſt be mov'd with a Gliſter.

℞. *Emollient Decoction* ℥ x. *Elect. Diacatholicon, Diaprunum, Solutive. an.* ℥. j. *Salt* ℥ j.

Or elſe infuſe two drams of Rubarb in Barley-water, and give him to drink, the ſtreining with one ounce of Syrup of Succory with Rubarb, or *Solutive Roſatum*. Stronger Purges muſt be avoided.

XI. He may alſo three or four times aday drink a draught of this Apozem.

℞. *Cleanſed Barley, Roots of Aſparagus, Graſs an.* ℥ j. *Licorice ſliced* ℥ ſ. *Venus-hair, Borage, Lettice, Endive, Violet-leaves an.* M. j. *Flowers of Wild-Poppy, Violets an.* P. ij. *Four great Colder Seeds an.* ℥ j. ſ. *Blew Currans* ℥ j. *Water* q. ſ. *Make an Apozem of* ℔ j. ſ. *with which mix Syrup of Poppy Rheas and Violets an.* ℥ j.

To allay the Cough let him take this Looch.

℞. *Syrup of Wild-Poppy, of Venus-hair, of Violets an.* ℥ j. *Mix them for a Looch.*

To allay the Pain, and to attenuate, diſcuſs and Concoct the Blood collected in the affected Part, Foment the Region of the affected Part, with this Fomentation.

℞. *Mallows Althea, Colewort, Chervile, Beats, Violet-leaves, Flowers of Camomil, Elder and Dill an.* M. j. *Water* q. ſ. *Make a Decoction to* ℔ ij. *For a Fomentation.*

Of the ſame may be compoſed a Cataplaſm, by adding Meal of Lin-ſeed and Barley, Oyl of Almonds and new Butter.

XIV. Let

XIV. Let him keep a Temperate Diet, and of eaſie digeſtion, Cream of Ptiſan, Chicken-broths prepared with Endive and Lettice, or elſe let him take ſome ſuch Amygdalate.

℞. *Sweet Almons blanched* ʒ ij. *Four great Colder Seeds, White Poppy Seed an.* ʒj ſ. *Decoction of Barley* q. ſ. *Make an Emulſion of* ℔ j. *with Sugar* q. ſ. *to ſweeten it gently.*

His ordinary Drink muſt be Ptiſan: or ſmall Ale, but not Sowre, or ſuch a Julep.

℞. *Decoction of Barley* ℔ j. *Syrup of Wild Poppy and Violets an.* ʒ j. *Mixt them for a Julep.*

Let him ſleep long, if poſſible, and uſe no Exerciſe.

HISTORY II.

Of an Empyema.

A Perſon about forty Years of Age, being ſeized with a terrible Pleuriſie in his left ſide, and not having any Remedies applied to him before the third day, found little eaſe, ſo that the Diſtemper continued till after the fourteenth day, being accompany'd with a Fever and other bad Symptoms; from that time forward he felt his Pain and his Fever much abated, only a ponderous heavineſs troubled him about the Ribs in the ſide affected. About the twentieth day the Fever ſtill continuing, though very ſlight, he felt a troubleſome Ponderoſity, with a little Pain, upon his *Diaphragma*, chiefly on the left ſide; and if he turned from one ſide to the other of a ſuddain, he felt a certain Humor to flow down, the Fluctuation of which was manifeſtly to be heard in the motion of his Body forward. He had alſo a dry Cough, but ſpit little or nothing; he could hardly fetch his breath, eſpecially if he lay upon his right ſide, he was faint and weak, eaſily and often ſweat: he loathed Victuals, and deſired rather Drink then Meat.

I. THis Man was afflicted with an *Empyema, which is a Collection of Corruption in the Cavity of his Breaſt.*

II. This Diſeaſe is known by the Signs preceding and preſent. The preceding Signs are the Pleuriſie it ſelf. Then the Pain and Fever ceaſing with any manifeſt Evacuation by Spittle; whence that heavineſs about the Ribs in the ſide affected. The preſent Signs are, the heavineſs upon the *Diaphragma*: the fluctuation of the Humor upon Motion of the Body: and a Cough to no purpoſe, with faintneſs, weakneſs, difficulty of Breathing, and loathing of Victuals.

III. The Matter was not Evacuated by Spittle. 1. becauſe the Lungs of this Patient did not ſtick cloſe to the place affected. 2. Becauſe the Matter in the Cavity of the Breaſt, could not enter the Lungs through the Pores of the Membrane inveſting the Lungs. 3. Becauſe perhaps the Pores of this Mans Lungs were ſo narrow, as not to admit ſuch ſort of thicker Humors.

IV. The Pain and Fever abated, becauſe the ſharp matter, of the Inflammation was turned to Matter, and ſo rendred more gentle. The quantity of which Matter contained within the Membrane, troubled the Ribs of the affected ſide, with its Ponderoſity. But upon breaking the Apoſthume about the twenty fifth day, the Matter flowing into the Cavity of the Breaſt, moleſted the *Diaphragma*, with its weight, and the Fluctuation of it was eaſily perceived in the Motion of the Body. For the weight hindred the depreſſed *Diaphragma* from moving freely, which cauſed the Pain in Breathing; eſpecially if he lay upon his right ſide, for that beſides the *Diaphragma*, the right Lobe of the Lungs is compreſſed by the weight of the Matter lying upon the *Mediaſtinum*.

V. The ſlight Cough proceeds from the Vellication of the exterior Tunicle of the Lungs, cauſed by the Acrimony of the Corruption. But nothing is ſpit forth becauſe the Matter touches only the out-

ſide

ſide of the Lungs, but never enters the *Aſpera Arteria*.

VI. The Patient is faint by reaſon of Reſpiration hindred; and weak, as having been weakned by the acute preceding Diſeaſe. And the Stomach and Liver being weakened by the ſame Cauſe, thence debility of Concoction and loſs of Appetite; and loathing of Meat; but drink is ſtill deſired, to quench the drought of the Fever.

VII. This is a dangerous Diſtemper, 1. Becauſe Reſpiration is damnified. 2. Becauſe it follows an acute Diſeaſe, that has much waſted the Body already. 3. By reaſon of the Difficulty to Evacuate the Matter out of the Breaſt. 4. Becauſe if the Matter ſtay but a ſhort time, it will putrifie and corrupt the Lungs. 5. Phyſic is uncertain; 6. Chyrurgery dangerous.

VIII. Therefore after a gentle Evacuation of the Belly, Expectorating Medicaments are to be made uſe of; to try if the Matter may be drawn away that way.

IX. To which purpoſe let him take this Apozem.

℞. *Roots of Elecampane* ʒ j. *Florence Orrice* ʒ ij. *Licorice ſhav'd* ʒ ſ. *Hyſſop, white Hore-hound, Venus-hair, Violet-leaves an.* M. j. *red Cabbage* M. ij. *Aniſe-ſeed* ʒ ij. *Four greater cold Seeds an.* ʒ j. ſ. *Raiſins cleanſed* ʒ iij. *Water* q. ſ. *Make an. Apozem of* ℔ j. ſ. *To which add Syrup of Horehound, Hyſſop, Oxymel an.* ʒ j.

Let him take three or four Doſes in a day. Now and then alſo let him take a lick of the following Looch.

℞. *Syrup of Horehound, Hyſſop, Jujubes, an.* ʒ j. *Saffron Pulverized* ϑ j. *Mix them for a Looch.*

Turpentine alſo reduced to a Cream with White of an Egg in Barley Water, and ſweetned with Sugar, may be very proper in this Caſe. For though theſe Medicaments be hot, yet the Fever being ſmall, there is more regard to be had to the Cauſe, which being taken away the Fever will ſoon go off.

X. If theſe or ſuch like Medicaments, will not bring away the Matter in a Fortnight, there is no more to be expected from Phyſic: So that the laſt Remedy muſt be the Chyrurgeons hand.

XI. To that purpoſe the Cheſt is to be cut through, as far as the inner Cavity with a ſharp Pen knife, under the Arm-pit, between the fifth and ſixth Rib, ſo as not to hurt the Intercoſtal Vein, Nerve or Artery, nor muſt the hole be very large, but ſuch as will admit a Silver hollow Pipe, which is preſently to be put in after the Inciſion, and ſo to be faſtened that it may not fall out of it ſelf. The fore part alſo is to be ſtopt; So that the Matter may not flow out, without the Chyrurgeons leave. Through this Pipe twice a day, half a Pint or a Pint of Matter more or leſs, is to be let out according to the quantity of the Matter, and the ability of the Patient to endure, and then the Pipe is to be ſtopped again.

XII. When no more Matter flows forth, the Lung and inner Cavity is ſometimes to be waſhed with this mixture ſyring'd into the wound.

℞. *Decoction of Barley* ʒ v. *Spirit of Wine* ʒ iiij. *Hony of Roſes, Syrup of Horehound an.* ʒ j. *Mix them for an Injection, to ſtay within for ſome hours, and then to be drawn out again through the Pipe.*

XIII. If the continual Efflux of Matter ſhews that the Ulcer within is not healed, abſtergent and vulnerary Decoctions muſt be uſed, and Injections moderately drying and abſtergent. And the Pipe is to be kept in the Wound, till no more Matter flow forth, and then to be taken out and the wound to be cloſed.

XIV. The Patients Diet muſt be attenuating and abſtergent, as Meats condited with Chervil, Hyſſop, red Cabbage, Beets, Fennel, Almonds, Raiſins. His Drink ſweetned with Sugar or Hony, or Hydromel. Moderate Sleep, and a ſoluble Body: and let him be ſure to avoid Paſſion and Anger.

HISTORY. III.

Of a Cough.

A Merchant in the prime of his Years, taking no care of his Diet, and many times traveling in cold and hot, in fair and fowl Weather, and many times ill fortified againſt the external Air, the laſt *Autum* began to be troubled with a Poſe, and toward Winter with a terrible Cough that laſted all the Winter long. Many times his Cough was extreamly violent, eſpecially toward the Evening, for an hour together, at what time he brought up a great quantity of tough and viſcous Slime, which ſometimes taſted ſaltiſh; he Cought very much after Meals, inſomuch that through the violent Agitation of his Stomach he brought up all he had eaten, with a great Pain in his Breaſt and Abdomen. After Vomiting his Cough ceaſed; he never ſpit Blood; he had no Fever, however his Body fell away, and his ſtrength waſted, yet not ſo, but that he ſtill went abroad about his buſineſs. Somtimes he was very Looſe. His Appetite held indifferent good, and he ſlept moderately well.

I. THE Lungs of this Perſon were chiefly affected, then the Stomach and ſeveral other Parts of the Body ſuffered under the violent Agitation of the Cough.

II. This Malady is called *Tuſis* or a Cough, *which is a violent forcing of the Breath, cauſed by a ſwift Contraction of the Breaſt and Lungs, whereby what is troubleſome to the Inſtruments of Breathing is expelled by the force of thein-breath'd Air.*

III. This Malady needs no ſigns to diſcover it.

IV. The anteceding Cauſe of this Diſtemper is a Cold and Flegmatic diſpoſition of the Air contracted by bad Diet. The Original Cauſe was Heats and Colds, violent and unſeaſonable Exerciſe. The containing Cauſe is Flegm in the Lungs, either by Defluction or Collection, partly twiching them with its Acrimony, partly obſtructing the *Bronchia* with its great quantity.

V. Cold Diet and of hard digeſtion bred Crudities and many ſaltiſh Humors, which for want of Concoction became Acrimonious. The Brain was refrigerated by the cold tempeſtuous Weather, and the Pores of the outward Head obſtructed, ſo that the Flegmatic ſerous Vapors aſcending from the lower Parts, ſoon condenſed in the Ventricles of the refrigerated Brain, which not being able to paſs through the obſtructed Pores, cauſed firſt a Poſe. Afterwards the fiercer Cold of Winter encreaſing the quantity of thoſe Humors, they being debarr'd their uſual Paſſages, by reaſon of their thickneſs, fell upon the *Aſpera Arteria* and Griſtles of the Lungs, and hinder Riſpiration: and the Acrimony of thoſe Humors farther moleſting the Pellicle of the *Aſpera Arteria* and *Bronchia*, enforces thoſe Parts to a violent Excluſion of the provoking Humors.

VI. This Cough had laſted long for want of care of Diet, and taking Remedies; whence a frequent defluxion of Catarhs to the Breaſt, the Cold of which in time much refrigerated and weakned the Lungs, ſo that Vapors riſing from the lower Parts, and ſtopping in the Lungs, were eaſily condenſed into a Viſcous liquor, that ſtopped up the Channels of the Lungs, and ſtuck like Bird-lime to the ſides of the *Bronchia*, which cauſed that violence of Coughing to ſhake off that tenacious Matter.

VII. The Cough was longer and more vehement, and threw off much more tenacious Flegm, in regard the Flegmatic Humors, that had been gathering together all day and night, about the beginning of the day, abounded in ſo great a quantity, that they could no longer be contained in the Head, but falling down upon the Lungs and tickling the *Bronchia* not only with their Acrimony provoked the Cough, but more plentifully filling the *Bronchia* contracted

tracted by the Vapors condenſed within them, and thence hindring Reſpiration irritated the Cough, as being that by which Nature endeavoured to throw off the trouble.

VIII. The Cough increaſed after Meals, becauſe the Vapors being raiſed by the ſwallowed Nouriſhment, and endued with ſome Acrimony fell upon the Lungs, and there condenſed ſtick to the refrigerated *Bronchia*, and tickling the ſenſible inner Tunicle both of them, and the *Aſpera Arteria* already prepared to eaſe Provocation by the former Humors, exaſperate the Cough; through the violent Agitation whereof and Compreſſion of the Muſcles of the *Abdomen*, the Stomach throws up all again; upon which the Cough ceaſes for a time, becauſe there is nothing in the Stomach from whence any more ſharp Vapors can aſcend to the Lungs.

IX. And by reaſon of the ſame violent Motion, and over frequent diſtenſion of the Muſcles, ſome Pain is felt in the Breaſt and *Abdomen*. And that Compreſſion forcing the Meat and Drink unconcocted out of the Stomach, cauſes a violent Looſneſs and dejection of the Nouriſhment.

X. There is no Fever, becauſe there is no Putrefaction of the Humor, but the Body is emaciated, and becomes very weak, becauſe the violent concuſſion of the Cough, weakens all the Parts of the Body; nor are they able to receive or retain the Alimentary Blood flowing through the Arteries, ſometimes looſe, ſometimes compreſſed as they ought to do. 2. Becauſe that violent Agitation expells the Nouriſhment received before due Concoction; by which means all the Parts of the Body are deprived of their due Nouriſhment, and conſequently muſt be very much weakned.

XI. The appetite continues, becauſe the Stomach is in good order, undiſturbed by the Catarrhs: the diſturbance of its Concoction being only accidental.

XII. He ſleeps moderately; becauſe the Flegmatic humor falls not in the Night from the Head to the Breaſt; beſides that the rapid Motion of the Animal Spirits to the Organs of the Senſes is for a while reſtrained by the Cold and Plenty of the Humors; ſo that the Organs are at reſt for a while for want of copious Spirits.

XIII. Such a Cough as this threatens great danger by reaſon of the Saltneſs of the Catarrhs, the Acrimony whereof in ſome Veins in the Lungs may be eaſily corroded and broken, thence Spitting of Blood and Exulcerations. Beſide that the Cure is difficult, by reaſon the cold ill Temper of the Brain and Lungs is of a long ſtanding; not eaſie to be removed.

XIV. In the Method of the Cure, 1. The vehemency of the Cough, and the Acrimony of the Catarrhs is to be allay'd. 2. The Tenacity of the Spittle is to be attenuated, concocted and brought to Maturation. 3. The cold ill temper of the Lungs and Head is to be amended, and the Parts to be Coroborated. 4. The falling down of the Catarrhs to the Lungs is to be prevented.

XV. After Purgation with *Chochiæ* Pills or Golden Pills, Electuary of *Hiera Picra* or *Diaphœnicon*, &c. this Apozem is to be preſcribed.

℞. *Roots of Elecampane, Acorus, Florence Orrice an.* ℥ ſ. *ſliced Licorice, Barley cleanſed an.* ℥ vj. *Scabious, Venus Hair, White Hore-hound, Betony, Coltsfoot an.* M j. *Oak of* Jeruſalem M. ſ. *Juniper-berrys* ℥ ſ. *Seeds of Aniſe and Fennel an.* ℥ ij. *Fat Figs* N°. ix. *Raiſins cleanſed* ℥ ij. *Water* q. ſ. *Boil them to* ℔ j ſ. *Add to the ſtraining Syrup of Stœchas, Horehound, Oxymel, Pectoral Magiſtral an.* ℥ j. *Mix them for an Apozem.*

To which you may afterwards add for the ſwifter Conſumption of the Flegm *Saſſaperil, Saſſafras and China-root.*

Alſo the Patient may make uſe of this Looch.

℞. *Syrup of Hyſſop, Horehound, Oxymel, Magiſtral an.* ℥ j. *Syrup of Stœchas* ℥ ſ.

Inſtead of which he may now and then take one of theſe Tablets.

℞. *Powder of the Root of Elecampane* ℈j. *Florence Orice* ℈ ij. *Licorice* ℥ j. *Saffron* gr. xiv. *Sugar diſſolved in Fennel-water* ℥ ij.

XVI. If after all the Cough ſtill remain, give him this Bolus twice a week as he goes to Bed.

℞. *Philonium Romanum.* Nicholas's *Rest, Mithridate of* Damocrates *an.* ℈ j. *Mix them for a Bolus.*

At other times let him use his Apozem and Tablets.

XVII. To corroborate his Head, let him wear this Cap.

℞. *Leaves of Marjoram, Rosemary* P ij. *Flowers of Red Roses and Lavender an.* P. j. *Nutmeg, Benjamin, Cloves an.* ℈ ij. *Beat them into a gross Powder for a Quilt.*

XVIII. If after all this, there be no abatement of the Catarrh and Cough, then to divert and evacuate the flowing humour, make an Issue in the Arm or rather in the Neck.

XIX. Let him keep his Head and Breast warm, against the Injuries of the cold and moist Air. Let his Diet be of easie Digestion and good Nourishment, seasoned with Turneps, Chervil, Hyssop, Marjoram, Betony, Baum, Rice, Barley cleansed, Spices, Raisins, Sugar and such like Ingredients. Let his drink be middling, not stale, Hydromel anchosated, or sweet Wine moderately taken: and let him avoid all acid, sharp, salt and sowre things. Let him be moderate in his Sleep and Exercise: and take care to keep his Body open.

HISTORY IV.

Of an Asthma.

A Young Man, thirty years of age, of a strong Constitution, but careless of his Diet, and living a sedentary Life, some years ago, having overheated himself with Walking, and presently opening his Breast, and throwing aside his Cloaths, fell a drinking cold Rhenish-Wine, and presently was taken with a Difficulty of Breathing, which made him pant and heave; and the next day, the Malady still increasing, he was in such a Condition, that the third Day he could not breath, unless he stood upright; so that for fourteen Days he could not lye in his Bed, but was forced to sit or stand whole Days and Nights together; but he was more troubled in the Night than Day time. After a little Cough happening, which brought up a good quantity of tough and viscous Flegm, his difficulty of Breathing abated, and he recovered his former Condition. From that time forward, he was often afflicted with the same Distemper by Intervals, sometimes more, sometimes fewer Days together, more especially if he exposed himself to the Air, when very hot, or drank cold Rhenish; and this he further observed, that when the North-wind blew, he was presently seized with this Distemper, unless he had a great Care of himself, and that rather in the Summer and Autumn, than in the Winter. During this Malady, his Stomach was indifferent, but he could hardly eat for narrowness of the Parts, and after Meals his Difficulty of Breathing grew worse. He had a great Inclination to Sleep, but no sooner had he closed his Eyes, but he waked with Terror and Faintness, so that during the Fit, he could not sleep for some Days and Nights together. His Belly and Breast seemed to be distended by Wind, sometimes he felt a heavy Pain in his Head, with a Chillines in the hinder Part toward the Neck. And about this time he had another terrible Fit, not without danger of Suffocation. He had no Fever, nor complained of any Pain in any other Parts of the Body.

I. This

I. THis Mans Diſtemper is an *Aſthma, which is a difficult panting and heaving Reſpiration*; and it was indeed the higheſt degree of this Diſtemper, which we call *Orthophnæa*, which is an extraordinary Difficulty of Breathing, in which the Patients cannot ſleep, but ſtanding upright, becuſe of the Narrowneſs of the Reſpiratory Parts.

II. The antecedent Cauſes of this Diſtemper were flegmatic Humors, abounding in the Body. The Original Cauſes were Heat and Cold. The containing Cauſe is a tough and viſcous Humor accumulated in the *Bronchia* of the Lungs, and faſtned to them.

III. The flegmatic Conſtitution of the whole Body cauſes a Redundancy of cold crude and flegmatic Humors therein. Eſpecially in thoſe Parts, which being cold of themſelves, are over-chill'd by ſome external Cauſe; ſo that the Body being overheated by violent Exerciſe, the Blood and Humors are more ſwiftly moved, and many Vapors excited in the lower Parts, which by a ſudden Cold are condenſed, and collected in the Brain in greater quantity. But in regard the *Bronchia* are cold of themſelves, and more refrigerated by the Cold of the In-breath'd Air, they faſten to them like a tough Bird-lime, and contracting them, cauſe difficulty of breathing. To which, the Acceſs of a Defluxion from the Brain, cauſes a greater Contraction, conſequently a greater Difficulty of breathing, attended with Wheezing. Nor can the Patient breath but ſtanding upright, the Lungs being pendulous, are moſt eaſily dilated in that Poſture, and the *Bronchia* are more open in that Situation.

IV. The Diſtemper is ſtill worſe toward Night; becauſe the nocturnal Cold thickens the Flegmatic Humors, and renders them more tenacious, by which means they become more obſtructive to the *Bronchia*.

V. At length, when the tenacious Matter is abated and thrown off by coughing, then the Obſtruction of the *Bronchia* abates, and the Difficulty of breathing ceaſes till the condenſing and falling down of new Vapors.

VI. Which was plain, becauſe the North-wind was ſo hurtful to him; the reaſon of which was becauſe that Wind ſtreightned the Pores, condenſed the Humors and Vapors, and chill'd the Head and Lungs. And becauſe the Body is hotter, and raiſes the Vapors more copious in the Summer, therefore the ſudden Chillineſs of that Wind more ſuddenly condenſes and faſtens them to the colder Bronchia.

VII. The Stomach of the Patient continued good, becauſe neither the in-breathed Air, nor the Defluxions from the Head offended the Stomach. But the Difficulty of breathing was worſe after Meals, by reaſon of the Vapors raiſed by the Concoction of the Stomach, which aſcending to the middle and upper Belly, are condenſed in both, and in the one faſten themſelves to the *Bronchia*.

VIII. He cannot ſleep, becauſe he is forced to ſatisfie the Neceſſity of Reſpiration, in the Dilatation of the Breaſt; which failing in Sleep, and conſequently Reſpiration, he is waked with Terror and Faintneſs, and compelled to wake that he may breath, and to breath with violence, that he may live.

IX. The Belly and Breaſt ſeem to be diſtended by Wind; though it be not Wind, but the continual and copious Flux of the Animal Spirits, for the Relief of the Lungs, which diſtends the Reſpiratory Muſcles, which makes him think they are diſtended with Wind.

X. The heavy Pain in his Head proceeds from the abundance of Cold Humors collected in his Head. And thence that Chillineſs in the hinder part of it.

XI. There was no Fever, in regard that neither the Blood nor Humors were corrupted. Nor Pain in any other Part, the ſharp Humors being all got together in the Head and Lungs of this Patient.

XII. This Diſeaſe is dangerous, as threatning a Suffocation, eſpecially if a new Defluxion fall from the Head upon the Lungs during the Continuance of the Malady.

XIII. In the Method of Cure, to the containing Cauſe muſt be removed that obſtructs the Lungs. 2. The next things required, are to hinder the Defluxions of Catarrhs to the Lungs. 3. To reform the cold ill Temper of the Head and Lungs. 4. To change the Flegmatic Diſpoſition of the Body, and abate the cold Humors abounding in the whole.

XIV. In the firſt place, let him take a common Gliſter, or a Suppoſitory: Let him uſe a thin Diet, and Sawce

his Meat with Hyſſop, Sage, Betony, Saffron, Aniſe, Fennel, Raiſins and the like.

XV. Let him often take a Spoonful of this Syrrup.

℞. *Syrup of Hyſſop, Horehound, Preſerved Ginger, and Roots of candied Elecampane an.* ℥ſ. *Compounded Magiſtral Oxymel* ℥j. *Mix them.*

Alſo in the Morning, and about five a clock in the Afternoon, let him take one dram of this Powder in a little Malmſey Wine, Hydromel or Broth.

℞. *Roots of Elecampane* ℥j. *Root of Florence, Orrice, Seed of Biſhops-weed, an.* ℥j. *Benjamin, Saffron, an.* ℈j. *Muſch* gr. j. *White Sugar Candy* ℥iij. *To which add Oyl of Aniſe, drops* iiij. *or* v.

XVI. The Fit ceaſing, let him be purged once a Week with *Cochiæ* or Golden Pills, *Hiera Picra*, or ſome Phlegmagog Infuſion. Blood-letting is not convenient.

XVII. Upon other days let him uſe this Apozem.

℞. *Root of Elecampane, Fennel, an.* ℥j. *Acorus and Licorice ſliced an.* ℥v. *Marjoram, Scabious, Venus Hair, Hyſſop, white Horehound, Savine an.* M.j. *Juniper Berry* ℥ſ. *Aniſe and Fennel-ſeed an.* ℥ij. ſ. *Raiſins cleanſed* ℥ij. *Water* q. ſ. *Boil them to* ℔j. ſ. *Add to the Straining Magiſtral Oxymel, Syrup of Stœchas, Horehound an.* ℥j. *Mix them for an Apozem.*

XVIII. Alſo let him often take a ſmall quantity of this Conditement.

℞. *Specier. Dianthos, Diambr. an.* ℥j. *Root of Elecampane candied, conſerve of Flowers of Sage, Anthos, an.* ℥v. *Syrup of Elecampane* q. ſ. *Mix them for a Conditement.*

XIX. To evacuate the Flegm out of the whole Body, Decoctions of Saſſafraſs and Saſſaperil are very proper, adding at the end ſome proper Cephalic and Pectoral Ingredients to corroborate the Head and Lungs. Alſo let him wear a Cephalic Quilt upon his Head; and laſtly, let him make an Iſſue in one Arm, or in the Neck.

XX. If the Patient mend upon the uſe of theſe Medicins, for removal of the farther Cauſe of this Miſchief, let him take every other day in a Morning a Draught of this medicated Wine.

℞. *Root of Elecampane dry* ℥ſ. *Of Florence, Hyſſop, Jalop an.* ℥j. ſ. *Hyſſop, white Horehound an.* M. ſ. *Juniper Berries* ℥ſ. *Aniſe and Fennel-ſeed, an.* ℥j. ſ. *white Agaric* ℈v. *Lucid Aloes* ℈iiij.

Tye them up in a Bag, and hang them in four or five pound of White-wine.

XXI. For preſervation, let him uſe this Bolus twice a Week, for three Weeks together.

℞. *Venice Turpentine* ℥iij. *white Sugar* ℥ij. *Mix them for a Bolus to be ſwallowed in a Wafer moiſtned in Malmſey Wine.*

XXII. His Diet has been already preſcribed. His Drink muſt be ſmall, his Sleep and Exerciſe moderate, and let him be ſure to keep his Body ſoluble and regular.

HISTORY. V.

Of the Quinancy.

A Young Man, about thirty years of Age, fleſhy, ſtrong and Plethoric, having overheated himſelf with hard Labour, and being very thirſty, drank a large Draught of ſmall Ale, brought him out of a cold Cellar. So that not able to endure the Coldneſs of the Drink in his Chaps, he was forced to take the Pot from his Mouth. Soon after he felt a certain Narrowneſs, with a Burning in his Chaps, and from thence ſome kind of Trouble in Breathing and Swallowing, which

which ſtill more and more increaſed. After ſeven or eight hours, a ſtrong Fever ſeized him, with a ſtrong, thick and unequal Pulſe, and the Difficulty of Breathing and Swallowing encreaſed to that degree, that he could hardly breath either ſitting or ſtanding, and his Drink preſently flew back out at his Noſtrils. His Mouth was dry, with an extraordinary Thirſt, which becauſe he could not ſwallow, no Drink could allay. His Tongue looked of a dark Colour, and being depreſſed with an Inſtrument, in the hinder Part an intenſe Redneſs appeared; but no remarkable Tumor was conſpicuous, becauſe it lies in a lower Place. The Frog-like Veins were thick and tumid. His Speech ſo obſtructed, that he could hardly be heard: Reſtleſs, he tumbled and toſſed, and was mighty covetous of the cool Air: Without there was no Swelling, but an unuſual Redneſs about the Region of the Chaps.

I. THis terrible Diſtemper is called *Angina*, or the Quinancy, *Which is a Difficulty of Breathing and Swallowing, proceeding from an Inflammation and Narrowneſs of the upper Parts of the Throat, Larynx and Chaps, and always accompanied with a continued Fever.*

II. This is no baſtard Quinancy Swelling of the *Tonſilæ*, with Redneſs cauſed by a Catarrh, but a real *Angina*, bred by a meer Inflammation.

III. The anteceding Cauſe of this Malady, is Redundancy of Blood, which being ſtirred by the original Cauſes, and copiouſly collected in the Chaps and Muſcles of the Larynx, and there putrifying, becomes the containing Cauſe. But the original Cauſes were hard Labour and cold Drink; the one exciting the Heat, the other chilling too ſoon.

IV. For the Body and Heart being heated by hard Labour, the Blood was rapidly moved by the ſtrong and thick Pulſations of the Heart, and ſwiftly paſs'd through the Veſſels; but the Blood in the little Veins about the Chaps being thickned by the coldneſs of the cold Drink, and the Roots and Orifices of the little Veins being likewiſe ſo ſtreightned, that the Blood ſent continually from the Heart, was not able to circulate through thoſe Paſſages, which cauſed a Detention of much Blood therein; thence proceeded the hot Tumor, which ſtreigthned the Paſſages of Reſpiration and Swallowing, and the Blood now no longer under the Regulation of the Heart, became inflamed and putrified, and part of it communicated to the Heart, kindled a continued Fever, about ſeven hours after, when the Matter was ſufficiently enflamed, and the efferveſcency was become grievous to Nature.

V. The Fever made the Reſpiration more difficult, becauſe the boiling Blood required more Room, and by that means encreaſed the Tumor and Narrowneſs of the Paſſages; beſides that, the feveriſh Heat requires more Reſpiration.

VI. His dryneſs of Mouth, and extream Thirſt, proceeded from the hot Vapors exhaling partly from the Inflamed Part next the Mouth; partly from the Heart and lower Parts, by reaſon of the Fever. Nor can he ſwallow his Drink, becauſe the upper Part of the Oſſophagus is ſo compreſſed and ſtrengthened by the inflamed Tumor, that nothing can paſs that way, ſo that the Drink is forced to find another Paſſage back through the Noſtrils.

VII. The Intenſe Redneſs that appears in the Chaps proceeds from the abundance of Blood in thoſe Parts, which being denied free Paſſage through the Frog-like Veins, is the Cauſe that they are ſweli'd too.

VIII. The Speech is diſturb'd by reaſon of the Inflamation of the Muſcles of the Larynx, and Difficulty of Breathing.

IX. There was no Tumor conſpicuous without, becauſe the whole Inflamation lay hid about the Larynx, *Oſſophagus* and Chaps, nevertheleſs a certain Redneſs extended it ſelf toward the outward Parts adjoyning to them.

X. This is an acute and dangerous Diſeaſe, which muſt be either ſpeedily cured, or ſudden Death enſues; for that the Inflamation and Tumor increaſing will cauſe a Suffocation. The Fever augments the Danger, for that the Patient being not able to ſwallow any thing, the internal Heat cannot be quenched by Drink, nor the Debility

of

of the Body be repaired by Nouriſhment. However there is ſome hopes, becauſe the Inflamation does not lye altogether hid in the Miſcles of the Larynx, but extends it ſelf to the outward Parts, where Topicks may be applied; beſides that, the Redneſs promiſes an Eruption of the Inflamation towards the outward Parts, to the great Benefit of the Patient.

XI. In the Method of Cure it is requiſite, 1. To hinder the violence of the Blood flowing to the Parts affected. 2. To diſcuſs the Blood already collected therein. 3. To promote Maturation. 4. To prevent Suffocation by Chyrurgery.

XII. The firſt thing therefore to be done is to let Blood freely in the Arm. And if once letting Blood will not ſuffice, to open a Vein in the other Arm, and a third time, if need require. Alſo to draw a good quantity of Blood from the Frog-veins.

XIII. In the mean time the Body is to be kept open with emollient Gliſters.

XIV. Let the Patient make frequent uſe of this emollient and diſcuſſing Gargariſm.

℞. *Sliced Licorice* ℥iij. *Two Turneps of an indifferent bigneſs, Scabious, Violet Leaves, Mallows, Mercury, Beets an.* M. j. *Flowers of Camomil, pale Roſes, an.* M. ſ. *Citron Peels* ℥ſ. *Water* q. ſ. *Boil them to* ℔j. ſ. *Add to the Straining Syrup of Dianucum* ℥ij. *Diamorum* ℥j. *Honey of Roſes* ℥ſ. *Mix them for a Gargariſm.*

If the Tumor ſeem to tend to Suppuration, add thereto,

Cleanſed Barley ℥j. ſ. *Leaves of Althea* M. j. ſ. *Figgs* n° ix.

XV. Outwardly apply this Cataplaſm.

℞. *Root of white Lillies* ℥j. ſ. *Leaves of Beets, Mallows, Mercury, Althea, Flowers of Camomil, an.* M. j. *Pale Roſes* M. ſ. *Fengreek Meal* ℥j. ſ. *The inner Part of one Swallows Neſt powdered, Water* q. ſ. *Boil them into the Form of a Poultis; to which add Oyl of Camomil* ℥ij. *Mix them for a Cataplaſm.*

If there be any likelihood of Maturation, add thereto,

Fat Figs n° vij. or viij. *Meal of the Root of Althea, Hemp-ſeed, Pulp of Caſſia, Oyl of Lillies an.* ℥j.

XVI. So ſoon as the Patient is able to ſwallow, purge him gently with an Infuſion of Rhubarb, Pulp of Caſſia, Syrup of Roſes ſolutive, or of Succory with Rheon.

XVII. Then give him this Julep for Drink.

℞. *Decoction of Barley* ℔j. ſ. *Syrup of Diamoron, Dianucum and Violets an.* ℥j. *Oyl of Sulphur, a little to give it a Sharpneſs. Mix them for a Julep.*

XVIII. If the Impoſthume break, let the Patient, holding his Head down, ſpew out the purulent Matter, and cleanſe the Ulcer with a Gargariſm of the Decoction of Barley, ſweetned with Sugar, Honey, or Syrup of Horehound or Hyſſop, of which Syrups a Looch may be made. Afterwards let him uſe a Gargariſm of Sanicle, Plantain, Egrimony, Cypreſs Nuts, red Roſes, *&c.* ſweetned with Syrup of dry Roſes and Pomegranates.

XIX. If while theſe things are made uſe of, the Difficulty of breathing increaſe, ſo that a Suffocation may be feared, before the Matter can be diſcuſſed or brought to maturity, the laſt Remedy is *Laryngotomic* or Inciſion of the Larynx; concerning which, conſult *Caſſerius* in his Anatomical Hiſtory of the Voice. *Aquapendens* in his Treatiſe De *Perforatione Aſperæ Arteriæ*; and *Sennertus*'s Inſtitutions, *L.* 5. *P.* 1. *Sect.* 2. *C.* 7.

XX. When the Patient can ſwallow, let his Diet be Cream of Barley, Amygdalates, thin Chicken and Mutton Broth boiled with Lettice, Endive, Purſlain, Sorrel, Damask Prunes, *&c.* Let his Drink be ſmall Ale, refrigerating Juleps and Ptiſans: Keep his Body ſoluble and quiet.

HIST.

HISTORY VI.

Of a Peripneumony, or Inflammation of the Lungs.

A Strong Young Man, having overheated himſelf with drinking Wine, after Mid-night drank a Pint of cold Water, and ſo expoſing himſelf to the cold nocturnal Air, went home. Preſently he felt a Difficulty of Breathing, which every moment encreaſed without any acute Pain in the Breaſt. However he felt a troubleſome Ponderoſity in the middle of his Breaſt, toward the Left-ſide. He had a little Cough, which after moleſted him, and cauſed him to ſpit bloody and frothy Matter, but not much. He had a great Redneſs upon his Cheeks. About three or four Hours after, a ſtrong and continued Fever ſeized him, with an extraordinary Drought and Dryneſs of his Mouth. His Pulſe beat ſtrong, thick and unequal, and his Head pain'd him extreamly; and his Difficulty of Breathing encreaſed to that degree, that he was almoſt ſuffocated.

I. THE chief Part here affected, was the Lungs, eſpecially the left Lobe, as appeared by the difficulty of breathing, and the heavineſs in the middle of the Breaſt toward the Left-ſide. By conſequence alſo the Heart and the whole Body.

II. This Diſeaſe is called *Peripneumonia*, which is an Inflamation of the Lungs with a continued Fever, difficulty of Reſpiration, and a ponderous trouble in the Breaſt.

III. A *Plethora* is the antecedent Cauſe of the Diſeaſe. The next Cauſe is greater Redundancy of Blood forced into the Subſtance of the Lungs, then is able to circulate. The original Cauſe, was too much overheating, and too ſuddain refrigeration.

IV. The Wine overheated the Body, thence a ſtrong and thick Pulſation of the Heart, by which the Blood attenuated by the Heat, was rapidly forced through the Arteries into the Parts; but being refrigerated by the actual Coldneſs of the Water drank, and the in-breath'd Air, and not able to paſs through the obſtructed Paſſages of the Pulmonary Veins and Arteries, begets that remarkable Swelling, accompanied with an Inflamation; partly through the Encreaſe of the Blood, partly by reaſon of its Corruption and violent Effervescency.

V. Now the *Bronchia* or Griſtles of the Lungs being compreſſed by this Tumor of the Lungs, the Reſpiration becomes difficult, and that Difficulty more and more encreaſes, becauſe every Pulſe adds ſome Blood to the Tumid Part.

VI. Then, becauſe the Lungs being ſwelled and diſtended, muſt needs be more heavy, thence that troubleſome Ponderoſity is perceived in the Breaſt, eſpecially toward the Left-ſide, becauſe the Inflamation poſſeſſes the ſiniſter Lobe. However, there is no great or acute Pain, becauſe there are no large Nerves in the Subſtance of the Lungs, which therefore have no quick Sence of feeling; and as for the inner Tunicle of the *Bronchia*, which moſt acutely feels, it is hardly affected with this Diſtemper, only the ſharp Heat of the putrifying Blood ſomewhat tickling it, and the thinner Particles of the Blood being ſqueezed into it, provoke a little Cough, accompanied with a little ſpitting of Blood.

VII. The Cheeks are red, by reaſon of the ſpirituous Blood boiling in the Lungs, which inſinuates it ſelf and its Vapors into the ſpungy Subſtance of the Cheeks; beſides that, there is a hot Exhalation from the inflam'd Lungs themſelves, with which fierce Vapors break forth out of the Chaps, and lighting within the Mouth into the Cheeks, make them much hotter, and encreaſe the Redneſs.

VIII. The continued Fever proceeds from the Blood, putrifying in the Lungs, and communicated continually to the Heart; which did not appear at firſt, till after three hours, that the Blood being

ing encreaſed in quantity and heat, began to putrifie and be inflamed; and then the Mouth became dry by reaſon of the fervid Exhalations drying the inſide of the Mouth. The Pulſe was ſtrong and thick, by reaſon of the quantity and heat of the Blood. Unequal, becauſe of the unequal Mixture of the putrid Particles, ſometimes more, ſometimes leſs communicated to the Heart.

IX. At the beginning of the Fever, the Difficulty of breathing encreaſed almoſt to Suffocation, becauſe of the greater quantity of Blood forced into the Heart by ſtronger Puſtles; partly, becauſe the Blood now putrifying and boiling in the Lungs, wants more room, and therefore cauſes a greater Compreſſion and Contraction of the *Bronchia.*

X. The Pain in the Head is cauſed by the ſharp Humors cauſed by the Wine exceſſively drank, and vellicating the Membranes of the Brain; partly by the hot Blood, and its ſharp Exhalation, forced by the Motion of the Heart into the ſame Membranes, ſomewhat chill'd by the Cold of the Nocturnal Air.

XI. This Diſeaſe is very dangerous, by reaſon of the Difficulty of breathing, and the Exceſs of the Fever. Beſides that, the Bowel is affected, which is next the Heart, and without the uſe of which, it cannot ſubſiſt.

XII. Therefore in the Method of Cure, a Vein is firſt to be opened in the Arm, and a good quantity of Blood to be taken away, and the ſame Bleeding to be repeated twice or thrice, if need require, which though it weaken the Party, yet it is better he ſhould be cured weak, than die ſtrong.

XIII. In the mean time let his Belly be moved with ſome ordinary Gliſter, as the Infuſion of Rhubarb, Syrup of Roſes ſolutive, Succhory with Rheon, Decoction of Pruens or ſolutive Electuary Diaprunum, or ſome ſuch gentle Purgatives, for ſtronger muſt be avoided.

XIV. To quench his Thirſt, give him ſome ſuch Julep.

℞. *Decoction of Barley* ℔j. ſ. *Syrup of Poppy, Rheas, of Violets, Pale Roſes, an.* ℥j.

XV. This Apozem may be preſcribed to take of it three or four times a day.

℞. *Roots of Succory, Colts-foot, Aſparagus Graſs, an.* ℥j. *Sliced Licorice* ℥ſ. *Violet-leaves, Endive, Coltsfoot, Lettice, Venus Hair, Borage, an.* M. j. *Flowers of Poppy, Rheas* p. ij. *Four greater Cold Seeds an.* ℥j. *Blew Currans* ℥j. *Water* q. ſ. *Boyl them to* ℔j. ſ. *Then add to the Straining Syrup of Poppy, Rheas, of Violets and pale Roſes an.* ℥j. *For an Apozem.*

Of the ſame Syrups equally mixt with a little Saffron added, may be made a Looch to alleviate the Cough.

XVI. If the Inflamation come to maturation, which will appear by the purulent Spittle, and the Diminution of the Fever, then firſt let him take abſtergent Apozems of Elecampane, Horehound, Hyſſop, Scabious, *&c.* alſo Looches of Syrup of Venus Hair, Horehound, Hyſſop, *&c.* And when the Ulcer is ſufficiently cleanſed, then come to Conſolidation.

XVII. Let the Patients Diet be Cream of Barley, Chicken and Mutton Broth, with cleanſed Barley, blew Currans, Endive, Lettice, Damask Pruens, and ſuch like Ingredients, boiled therein, or Almond Milk: For his Drink, ſmall Ale, or the aforeſaid Julep.

HISTORY VII.

Of Spitting Blood.

A Luſty Young Man accuſtomed to a ſalt, hard and ſharp Diet, having many times expoſed himſelf bare Headed to the Cold of the Winter Air, and thence contracted firſt a terrible Poſe, with a heavy Pain in his Head, was after moleſted with a violent Cough, cauſed by ſharp Catarrhs deſcending upon his Breaſt, that brought him to ſpit up a great quantity of Blood, and that not without ſome pain. At firſt a Phyſitian being ſent for let him Blood in the Arm, and took away

away a good quantity, which appeared cold, very thin and ill coloured, and ſomething but very little coagulated; the Blood-letting ſtopped his ſpitting of Blood for two days, but afterwards it returned again. His Appetite failed him, and his ſtrength decay'd; but he had no Fever.

I. THE Primary Malady that afflicted this Man is called by the *Greeks* αἱμόπτυοις, by the Latines *Sanguinis Sputum*, or ſpitting of Blood.

II. In general it is a Symptom of Excrements flowing from the Lungs and the Veſſels belonging to it; but the Diſeaſe which follows that Symptom is a Solution of the *Continuum*.

III. The Part Primarily affected is the Lungs, with it's Veſſels, which appears by the Cough, and the Blood ſpit out with the Cough: which comes away without Pain, becauſe of the little ſence of Feeling in the Lungs. The Poſe and falling down of the Catarrhs, ſhew the Head to be affected in like manner. Secundarily, and the other Parts ſuffer nothing, but only as they are wearied by the violence of the Cough, and weakened by that, and the Evacuation of the Blood.

IV. The anteceding Cauſes are the ſharp and crude Humors, deſcending from the Head to the Lungs, which vellicating the reſpiratory Parts by their Acrimony, cauſe a terrible Cough, and by their Corroſion, a Solution of the *Continuum*. The Original Cauſes are the External Cold, the obſtruction of the Pores of the Head, and what ever others that cauſe a Collection of crude Humors, or an endeavour to expel them being colected.

V. Diſorderly Diet and ill Food bred a great quantity of bad and ſharp Humors in the Body, and made the Blood it ſelf thin and ſharp; hence many ſharp Vapors were carry'd to the Head, which wont to be evacuated through the uſual Paſſages and Pores, which being ſtopped and contracted by the Cold, the Humors likewiſe condenſed, with their viſcous Slime beſet the Spongy-bones of the Noſtrils, and ſo cauſed the Poſe, which was attended with a heavy Pain in the Head, while the detained Humors diſtended the Membranes of the Brain; afterwards deſcending to the *Aſpera Arteria* and Lungs they induced a violent Cough, and Corroſion of the Veſſels, upon which enſued a Solution of the *Continuum*, while the Veſſels were broken and opened by the Violence of the Cough.

VI. That the Blood abounded with bad and ſharp Humors appeared from hence, that being let out of the Veins, it was thin and ill colored.

VII. This ſpitting of Blood returned again, becauſe that when the opened Veſſels are emptied, there is ſome time required before they can be filled again: but no ſooner are they ſwelled with more Blood, but it burſts out as before.

VII. Now the reaſon why the Blood ſtopped for two days after the Blood-letting, was becauſe by that Evacuation the Heart was debilitated and the Puſtles grew weaker, ſo that leſs Blood was forced out of the right Ventricle of the Heart into the Lungs. But after two days the Heart gathering ſtrength and filling the little Veſſels of the Lungs with Blood, the violence of the Cough eaſily forced it out again.

IX. The Appetite was loſt, through the continual Agitation of the Cough, and weakneſs cauſed by the Evacuation of ſo much Blood; which cauſed a Debility of the whole Body and Bowels together with the Stomach. Beſides that bad Diet had bred ſeveral crude Humors in the Stomach, which had dulled the Appetite and weakened Concoction.

X. The decay of ſtrength proceeded from loſs of Blood and the Bodies being wearied by the violent Agitation of the Cough.

XI. This Diſeaſe is very dangerous. 1. In reſpect of the Part affected; ſince no man can want Reſpiration. 2. In reſpect of the Cauſe; which is partly a Corroſion, partly a Rupture of the Veſſel. 3. In reſpect of the difficulty of the Cure, which requires reſt, which is not to be expected in the Reſpiratory Parts. Neither can the Solution be taken a part, but the Flux of the Catarrhs, and the Cough muſt be cured together. Therefore ſays, *Faventinus*, *Blood being ſpit from the Lungs with a Cough, the broken Vein cannot be cloſed but with great difficulty.* For when any little Veſſel of the Lungs is opened or broken, an Ulcer follows, which brings

a Conſumption that ſoon terminates in Death. All the hopes of this Patient conſiſted in his Age and ſtrength.

XII. In the method of the Cure, the Cough is firſt to be allay'd. 2. The Blood to be diverted from the Lungs. 3. The broken Veſſels to be conſolidated. 4. The deſcent of the Catarrhs to be prevented. 5. The crude and ſharp Humors to be hindred from gathering in the Head. 6. The deprav'd Conſtitution of the Blood and Humors to be amended.

XIII. After Glyſtering, or ſome Lenitive Purge given at the Mouth, Blood-letting is moſt proper, which is to be repeated as neceſſity requires; eſpecially when the Patient perceives any heavineſs in the lower Part of the Breaſt, for the Blood-letting hinders the repletion of the Veſſels of the Lungs, and their being forcibly opened by the quantity of Blood.

XIV. To thicken the Blood and the Catarrh, and allay the Cough,

℞. Haly's *Powder againſt the Conſumption* ℈ ij. ſ. *Red Corral prepared* ℈ j. *Decoction of Plantain*, ℥j. *Syrup of Comfrey* ℥ ſ. *Mix them to be drunk Morning and Evening.*

Let him often in the day uſe the following Looch and Amigdalate.

℞. *Syrup of Comfrey, dry Roſes, Colts-foot an.* ℥ vj. *Of Poppies* ℥ iij. *Mix them for a Looch.*

℞. *Sweet Almonds blanched* ℥ ij. ſ. *Lettice Seeds* ℥ ſ. *Decoction of Barley* q. ſ. *Make an Emulſion of* ℔ j. *with which mix with white Sugar* q. ſ. *For an Amidgdalate.*

XV. To divert the Catarrh, make an Iſſue in the Arm or Neck, and apply Cupping-glaſſes to the Scapula and Back. And to prevent the Collection of crude Humors, let him wear a Cephalic Quilt, compoſed of Ingredients to heat and corroborate the Head, dry up the Humors and open the Pores; and to open the Paſſage of the Noſtrils, let him take ſome gentle Sternutory.

XVI. When the Cough is thus removed, and the Blood-ſpitting ſtopped, proceed to the farther conſolidation of the corroded and broken Vein. To which purpoſe the Patient muſt be gently Purged by Intervals, to evacuate the ſharp Humors by degrees. In the mean time let him drink this Apozem thrice aday.

℞. *Barley cleanſed* ℥ j. *Roots of the greater Conſownd, Tormentil, Snake-weed, ſliced Licorice an.* ℥ vj. *Sanicle, Herb Fluellin, Winter-green, Colts-foot, Egrimony, Ladies Mantle, Plantain. an.* M. j. *Red Roſes* M. j. *Heads of white Poppy* ℥ ij. ſ. *The relicks of preſt Grapes,* ℥ iij. *Figgs* N°. v. *Make an Apozem of* ℔ j. ſ.

Inſtead of this he may take the quantity of a Nutmeg of this Conditement,

℞. Haly's *Powder againſt a Conſumption* ℥ j. ſ. *Coral Prepared, Blood-ſtone, Harts-horn burnt an.* ℈ j. ſ. *Conſerve of Red Roſes* ℥ ij. *Syrup of Comfrey* q. ſ.

XVII. His Diet muſt be of good Juice and eaſie Digeſtion, and ſomewhat of a clamy Subſtance, as Veal, Lamb, Mutton, and Broths of the ſame, ordered with Barley, Rice, Reaſons, *&c.* More eſpecially Goats Milk. Let his Drink be ſweet Ale, not too ſmall, let him not any way ſtrain his Voice: and for his Body let him keep it ſo ſoluble, that his Stools may be eaſie.

HISTORY VIII.

Of a Conſumption.

A Luſty Young Man, twenty two Years of Age, having for a long time lived diſorderly, at firſt felt for ſome time a heavy pain in his Head, which ſeeming to abate about Winter, preſently he began to be moleſted with a Defluxion of ſharp Humors to the Lungs, and thence with a violent Cough, which brought up every day a great quantity of thick tough Flegm, after he had been troubled with this Cough for ſome Months, at length he brought up Blood mixed with his

his other Spittle: and about three Weeks or a Month ſince purulent matter was obſerved to be mixed with his Spittle, ſometimes without, ſometimes mixed with Blood, of which he hauk'd up every day more and more. However his Spittle had no ill ſmell; he had alſo a continual ſlight Fever, but attended with no ſignal Symptoms, his Noſtrils were dryer then uſually; and out of which there came little or nothing to ſpeak of; he was much Emaciated and very Feeble. His Appetite loſt, or very little: and his Cough frequently interrupted his ſleep.

I. SEveral Parts of this Young Mans Body were affected; The Head, as appeared by the Pain therein, and the Catarrhs. The Lungs, as appeared by Cough and Spittle; and the Heart, as was manifeſt by the Fever; and conſequently the whole Body was out of Order.

II. This Diſeaſe is called *Phtiſis*, or a Conſumption, *Which is an Atrophy or waſting of the whole Body, proceeding from an Ulcer in the Lungs, with a ſleight lingring Fever.*

III. The remote Cauſe of this Diſeaſe was diſorderly Diet, which bred many ſharp and viſcous Humors in the Body; and the going careleſly uncovered in the Winter time, bred a cold ill temper in the Head, which contracted and ſtopped the Pores of it: by which means the Vapors aſcending from the lower Parts, condenſed in the Brain, and for want of paſſage, begot a heavy Pain in the Head, being as yet more ponderous than acrimonious, and lodged in the leſs ſenſible Ventricles of the Brain.

IV. The ſame Humors with their viſcoſity had obſtructed the uſual Paſſages of the Noſtrils and Palate, and ſo finding no other way, fell down upon the Lungs and *Aſpera Arteria*, which cauſed the Cough; at what time the Head-ach abated, becauſe the condenſed Humors having found out a new Channel, were no longer troubleſom to the Head.

V. By the Acrimony of the Catarrhs ſome Corroſion was made in the Lungs; and thence, the violence of the Cough preceding, an effuſion of Blood mixed with the Spittle, yet not very much, becauſe none of the larger Veſſels were either corroded or dilacerated by the fury of the Cough. Suppuration and an Ulcer followed the Corroſion; whence the Purulent matter ſpit up; which became ſtill more and more, as the Ulcer increaſed. However as yet it has no ill ſmell, becauſe the Ulcer is not come to that degree of Putrefaction.

VI. the ſleight Fever proceeded from the Humors putrifying about the Ulcer. For the Blood forced from the right Ventricle of the Heart, cannot but receive ſome infection from the putrified Humors about the Ulcer, and carry it to the left Ventricle, where it kindles that Fever; which is but ſleight, becauſe the Putrefaction is not great. But continual, for that every time the Heart dilates, ſomething of that Putrefaction falls into the left Ventricle.

VII. The Noſtrils are dry, becauſe the Flegmatic humors have found out other Paſſages to the Breaſt, and none come to the Noſtrils.

VIII. The Patient is emaciated, becauſe the Blood is corrupted by the putrid Humors continually heated in the Heart, and mingled with the Blood, which is thereby made unfit for Nouriſhment, and uncapable of Aſſimulation with the Parts.

IX. The Appetite decays, becauſe the Stomach not being nouriſhed with good Blood, grows weak and breeds bad Humors; beſides that the continual and violent Agitation of the Cough deſtroys the natural Conſtitution of it, ſo that it is not ſenſible of that Coroſion which begets Hunger, neither can it conveniently retain nor concoct the Nouriſhment received.

X. By what has been ſaid, it is apparent that the Diſeaſe is a Conſumption; the certain Signs of which are Bloody and purulent Spittle, a ſoft and lingring Fever, and a waſting of the whole Body.

XI. This Diſeaſe is very dangerous; 1. Becauſe the Ulcer is in ſuch a Bowel, the uſe of which cannot be ſpared. 2. Becauſe it is in a Spungy part that is not eaſily conſolidated. 3. Becauſe attended with a Fever that drys up the whole Body. 4. Becauſe there is a great waſt and decay of ſtrength. 5. Becauſe the Cure of the Ulcer requires reſt, whereas the Lungs are always in continual Motion. 6. Becauſe the Medicaments do not come to the Lungs with their full Vertue but through various

Concoctions. 7. Because a Fever and an Ulcer require different Remedies.

XII. The Method of Cure requires, 1. That the cold ill Temper of the Head be amended, the generation of cold Humors, and the defluctions of cold Humors, and the Cough be prevented and allay'd. 2. That the Ulcer be cured and the Fever be remov'd.

XIII. First, Therefore the defluction of the Catarrhs is to be diverted from the Breast by Issues in the Neck or Arm. The Head is to be corroborated, the redounding cold Humors are to be dry'd up, and the obstructed Pores to be opened. To which purpose the Temples and Bregma are to be anointed Morning and Evening with Oyl of Rosemary, Sage, Amber, Nutmegs, *&c.* Let him also wear a Quilted Cap stuft with Cephalics, for some time.

℞. *Leaves of Marjoram and Rosemary an.* ʒ j. ſ. *Flowers of Rosemary, Lavender, Melilot an.* ʒ. j. *Nutmegs* ℈ ij. *Cloves, Storax an.* ℈ j. *Beat them into a gross Powder for a Quilt.*

XIV. The Belly is to be gently moved with Manna or Syrup of Roses Solutive.

XV. Then to facilitate Excretion of the Spittle with such Remedies as at the same time may heal the Ulcer.

℞. *Syrup of Venus-hair, of Comfrey, of dried Roses an.* ʒ j. *Mix them for a Looch.*

Or such kind of Trochischs,

℞. *Flower of Sulphur, Powder of sliced Licorice an.* ʒ j. *Root of Florence Orrice* ℈ ij. *Haly's Powder against a Consumption* ʒ iij. *Benjamin, Saffron, an.* ℈ j. *White Sugar* ʒ v. *With Rose-water* q. ſ. *Make them into a Past for Trochiſchs.*

XVI. If the Cough continue very violent, add to the Looches a little white Syrup of Poppy. Moreover to allay the Cough and recover strength, let him frequently take of this Amygdalate.

℞. *Sweet Almonds blanched* ʒ ij. ſ. *Four greater Cold Seeds an.* ʒ j. *Seed of white Poppy* ʒ iij. *Barley water* q. ſ. *Make an Emulsion to* ℔ j. *To which add Syrup of Popies* ʒ ij. *Sugar of Roses* q. ſ.

XVII. Afterwards for the more speedy closing the Ulcer, use this Conditement.

℞. Haly's *Powder against a Consumption,* ʒiij. *Old Conserve of Red Roses* ʒ j. ſ. *Syrup of Comfrey, For a Conditement.*

XVIII. Let his Food be easie of Digestion, and very nutritive, as potched Eggs, Veal, Mutton and Chicken-Broath, with cleansed Barley, Raisins, Rice, Almonds, Chervil, Betony, and such like Ingredients: also Gellys of the same Flesh. Let him drink Goats Milk Morning and Evening warm from the Udder, and not eat after it for some hours. Let his Drink be Ptisans sweetned with Sugar of Roses. Let him sleep long, keep his Body quiet, and his Belly soluble.

HISTORY IX.

Of a Syncope.

A Man forty Years of Age, of a Flegmatic Constitution, after he had fed largly upon Lettice, Cowcumbers, Fruit, Whey, and such like Diet all the Summer long at length having lost his Stomach became very weak with a kind of sleepiness and numness, and a Syncope which often returned if any thing troubled or affrighted him: which Syncope held him sometimes half an hour, sometimes longer with an extraordinary chillness of the extream parts, and much cold Sweat; so that the standers by thought him Dead. Coming to himself he complained of a Faintness of his Heart, and with an Inclination to Vomit voided at the Mouth a great quantity of Mucous Flegm; no Fever nor any other Pain.

I. Many

I. MAny Parts in this Patient were affected, and many times the whole Body, but the Fountains of the Disease were the Stomach and Heart, whence all the rest proceeded.

II. The most urging Malady was a thick Syncope, which is a very great and Headlong prostration of the Strength proceeding from want of heat and Vital Spirits.

III. Now that it was a Syncope and no Apoplexy is apparent from the Pulse and Respiration, both which cease at the very beginning; whereas at the beginning of an Apoplexy they continue for some time.

IV. The remote cause of this Syncope is disorderly Dyet, crude and cold, which weakens the Stomach, that it cannot perfect Concoction; and thence a vast quantity of viscous Flegm which adhering to the upper Orifice of the Stomack begets in that cold and moist Distemper which destroys the Stomach. And becaus there is a great consent between the Stomach and the Heart by means of the Nerves of the sixth Conjugation, inserted into the Orifices of the Heart and *Pericardium*; hence the Heart beomes no less languid, and fainting, sometimes suffers a *Syncope*. For that Flegmatic Blood affords very few Spirits, for want of which the strength fails, and sometimes is ruin'd alto gether.

V. And not only the Animal, but the Vital Actions fail, for the Vital Spirits failing in the Heart, the Animal fail also in the Brain. And the Motion of the Heart failing, the Motion of the Brain fails, which renders the Body numb'd and sleepy, though the Syncope be over.

VI. In this Syncope the Patient lies like a dead Man, by reason of the extraordinary Prostration of the Strength and Vital Actions. The External Parts are cold, for want of hot Blood from the Heart. There is a cold clammy Sweat, in regard the thin Vapors which otherwise used insensibly to exhale through the Pores of the Skin, are suddenly condensed by the sudden want of Heat, and so sticking viscous to the Skin, begets a cold Sweat. Nor is there hardly any Respiration to be perceived, for that the fainting Heart sends no hot Blood to be cool'd in the Lungs; besides that, the Motion of the Heart and Brain failing, few or no Animal Spirits are sent to the Respiratory Muscles.

VII. The Syncope ceasing, the Languor of the Heart remains, by reason of the great quantity of Flegm contained in the Stomach, which flows out at the Mouth with a kind of nauseating.

VIII. This is a dangerous Malady, as well in respect of the Principal Bowel affected, as in respect of the Cure, in regard of the Weakness of the Patient.

IX. The Cure is as well to be begun during the Syncope, as when it is over.

X. During the Syncope, the extream Parts are to be rubbed with Musk, Amber, Benjamin, green Baum bruised, and such other odorous Smells are to be held to the Nostrils, either alone, or mixed with Wine or Spirit of Wine. A little of *Matthiolus's Aqua Vitæ*, Spirit of Wine, Cinnamon-water, or Hippocras is to be powered down his Mouth with a Spoon; and the Region of the Stomach to be fomented with this Epitheme warmly applied.

℞. *Rosemary, Baum, Mint, Leaves of Lawrel an.* M j. *Nutmegs, Cinnamon, Cloves an.* ʒj. s. *Fennel Seed* ʒij. *Generous Wine* q. s. *Boil them according to Art to* ℔j. *To the Straining add Spirit of Wine* ʒij. *For an Epitheme.*

XI. When the Syncope is past, the Flegm accumulated in the Stomach is gently to be removed. To which purpose let him take this Bolus.

℞. *Electuar. Hiera Picra* ʒij. *for a Bolus.*

Or this Powder,

℞. *Root of Jalap, Cinnamon an.* ℈j. *Diagridion* gr. iiij. *Make them into Powder.*

XIII. Afterwards to strengthen the Heart and Stomach, and gently to purge away the Flegm, this medicated Wine is very proper. Of which, let the Patient take a Draught every Day, or every other Day.

℞. *Root of Elecampane* ʒs. *Acorus, Galangale an.* ʒij. *Baum, Marjoram, Tops of Wormwood, an.* M. s. *Orange Peels, Juniper Berries an.* M. s. *Fennel and Anise seed, an.* ʒj. s. *Agaric, Lucid Aloes an.* ʒj. *Choice Cinnamon* ʒij. s. *Cloves,* ℈ij. *Put these into a Bag, to*

be

be hung in ℔iiij. *Of odoriferous White-wine.*

XIV. In the day time, let the Patient now and then drink a little Hippocraſs or Hydromel, after a little Bag of Cinnamon, Nutmegs, Ginger, Cloves and Grains of Cardamum has been hung. Or take now and then a ſmall quantity of this Conditement.

℞. *Specier. Diambræ, Sweet Diamoſch, an.* ʒj. ſ. *Orange-peels, Roots of Elecampane, Ginger condited an.* ʒſ. *Conſerve of Anthos* ʒv. *Oyl of Cinnamon, and Cloves an.* gutt. ij. *Syrup of preſerved Ginger* q. ſ. *For a Conditement.*

Or let him uſe theſe Tablets.

℞. *Choice Cinnamon* ℈ij. *Mace, Cloves, White Ginger an.* ℈j. *Specier. Diambræ* ʒj. *Sugar diſſolved in odoriferous Wine* ʒiij. *For Tablets.*

XV. Outwardly apply this little Bag to the Region of the Heart and Stomach.

℞. *Cloves, Cinnamon, Nutmeg, Storax, Benjamin, an.* ℈j. ſ. *Leaves of Marjoram and Roſemary, an.* M. ſ. *Reduce them into a groſs Powder to be ſowed into a little Bag.*

Laſtly, that which is called the Amber Apple; or Storax, Benjamin, Grains of Cardamom, Cloves or other odoriferous Spices ſomewhat bruiſed, and ty'd up in a thin piece of Silk, or put into an ivory or ſilver Box perforated, will be very proper to ſmell to.

XVI. When the Patient begins to recover Strength, let him take a ſpoonful or two of this Mixture.

℞. *Strong Rheniſh-wine* ʒiiij. *Cinnamon-water* ʒj. *Matthiolus's Aqua Vitæ* ʒvj. *Confection of Alkermes* ʒj. ſ. *Perl'd Sugar*, q. ſ. *to a moderate Sweetneſs.*

For want of this Compoſition, let him take a little generous Wine, or Spirit of Wine, or *Matthiolus's Aqua Vitæ.*

XVII. Let his Chamber be ſtrewed with odoriferous Herbs, as Baum, Thyme, Marjoram, Roſemary, *&c.* or elſe be perfumed with Cephalic Spices.

His Diet muſt be ſparing, eaſie of Digeſtion, and very nutritive, as the Juices and Gravies of Chickens and Partridges, Gellies of Mutton, Veal and Hens prepared with Baum, Roſemary, Sage, Roots of wild Raddiſh, Aniſe and Fennel-ſeed, Nutmeg, Cloves, Pepper, Ginger, Cinnamon, *&c.*

His Drink muſt be midling Wine, Hydromel or Ale moderately taken, tinctured with a little Wormwood. Nor will it be amiſs to take now and then a little Wormwood-wine or Hippocraſs, or a ſpoonful of *Matthiolus's Aqua Vitæ*, or Spirit of Juniper Wine, Cinnamon or Fennel Wine. His Sleep and Exerciſe muſt be moderate and gentle, and his Excrements muſt have their due and regular Courſe.

HISTORY X.

Of the Palpitation of the Heart.

A Luſty young Man, about thirty four years of Age, but ſomewhat Scorbutic, and for a long time accuſtomed to ſalt Meats dryed in the Smoak, and pickled in Vinegar, and other Food of hard Digeſtion, many times complained of a troubleſome Ponderoſity in his left Hypochondrion. Afterwards, about three or four hours after Meals, he felt a ſtrong Palpitation of his Heart, accompanied with a ſtrong Pulſe, very unequal, and ſometimes intermitting for two or three ſtroaks together; at what time he was ſeized with an extraordinary Faintneſs. This Palpitation laſted for half an hour, then ceaſed again; after which, ſlight, but frequent Palpitations often return'd. His Appetite was indifferent, and his Stomach digeſted well. He ſlept alſo very well, only ſometimes he was troubled with frightful Dreams.

I. The

I. THE Part moſt manifeſtly affected in this Patient, was the Palpitation of the Heart, which is a diſorderly, and over vehement Motion of the Heart.

II. The Proximate Cauſe is a ſalt and ſharp Humor mingled with the Blood, which being mixed with the Chylus, concocted out of ſharp and ſalt Food, and three or four hours after Meals, poured forth into the hollow Vein, and ſliding with it into the Heart, cauſes a diſorderly and vehement Fermentation in the Chyle, which is to be turned into Blood. For the ſharp and ſalt Particles of the Chylus, together with the Veiny Blood impregnated with that ſharp Humor, falling into the Heart, too much augment the Fermentation; whence that vehement and diſorderly Dilatation and Contraction of the Heart, which cauſes that Inequality and ſtrong beating of the Pulſe.

III. Now in regard there are many fixed and thicker Particles mixed with the thinner Particles of that ſalt and ſharp Humor, which cannot be ſo ſoon diſſolved and attenuated in the Heart; therefore, while the Heart is buſied in the Diſſolution and Dilatation of them, the Pulſe intermits for a ſtroke or two, whence ariſes the Faintneſs, for that no Spirits are forced to the Parts while the Pulſe ceaſes.

IV. This vehement Palpitation laſts half an hour, becauſe in that ſpace all the Chylus of one Meal, or the greateſt part of it, is mixt with the Blood in the hollow Vein, and paſſes through the Heart, and the Remainders more or leſs, cauſe thoſe ſlighter Palpitations afterwards.

V. Now the reaſon why that ſharp Humor continually flowing with the Veiny Blood to the Heart, does not cauſe a continual Palpitation, is, becauſe the Particles of the Blood and ſharp Humor fermented in the Heart, are many times more equal, more mitigated, and leſs ſharp, ſo that ſuch vehement Effervеſcencies cannot be excited in the Heart, eſpecially if they fall into the Ventricles by degrees, and in leſſer quantity. But when the Body being heated by exerciſe, the Blood more copiouſly and rapidly paſſes through the Heart with its ſharp Particles mixed with it, then the Heat encreaſing, and the ſharp Humors abounding, the Effervеſcency increaſes, and thence the vehement Palpitation, which abates upon Reſt, and Diminution of the Heat, and extraordinary Motion of the Blood.

VI. This ſalt and ſharp Humor is bred through a particular Depravity of the Spleen, and emptied out of it into the Liver, through the Spleenic Branch, where it is concocted with the ſulphurous Juice, and mixed in the hollow Vein with the Blood flowing to the Heart. The Vice of the Spleen is a depraved and ſalt ill Temper, with ſome Obſtruction, cauſing that troubleſome Ponderoſity.

VII. The Stomach ſtill craves and digeſts well, becauſe it is not affected, beſides that, the ſame ſharp Humors carried with the Blood through the Arteries to the Tunicles of it, raiſe a Fermentation within it.

VIII. He ſleeps well, but troubled with troubleſome Dreams, becauſe that Vapors aſcending to the Brain do cauſe Sleep, but being ſomewhat ſharp, they twitch the Membranes of the Brain, and the beginnings of the Nerves, and ſo diſordering the Fancy, procure frightful Dreams.

IX. This Diſeaſe is dangerous, becauſe the Heart is affected, and becauſe the depraved Diſpoſition of the Bowels is not ſo ſoon reformed.

X. The Cure aims at three things. 1. To correct the Depravity of the Spleen. 2. To attenuate and concoct the ſalt and ſharp Humors in the Brain. 3. To corroborate the Heart.

XI. Firſt then, let the Patient be three or four times purged with *Pill. Cochiæ*, Hiera Pills, or Golden Pills, Electuary of *Diaphœnicon*, *Hiera Picra*, Confection Hamech, or Infuſion of Senna Leaves, Agaric, *&c.*

XII. Afterwards let him take this Apozem.

℞. *Roots of Elecampane, Fennel, an.* ℥j. *Of Capers, Tamariſch, an.* ℥ſ. *Germander, Dodder, Fumitory, Borage, Motherwort, Water Trefoil, an.* M. j. *Baum* M. ij. *Citron Rind, Juniper Berries, an.* ℥v. *Fennel-ſeed* ℥iij. *Blew Currans* ℥ij. *Water and Wine equal Parts. Boil them to an Apozem of* lbj. ſ.

XIII. After he has taken this, let him drink every Morning a Draught of this medicated Wine.

℞. *Roots of Acorus, Elecampane an.* ℥j. *Of Capers and Tamariſch an.* ℥ij. *Water Trefoil, Germander, an.* M. ſ. *Orange-peels,*

peels ʒs. *Juniper Berries* ʒvj. *Choice Cinnamon* ʒj. ſ. *Cloves* ℈j. *Fennel-ſeed* ʒij. *Lucid Aloes, white Agaric an.* ℈iiij. *Make them into a Bag to be ſteeped in Wine*

XIV. In the Afternoon, let him take the quantity of a Nutmeg two or three times.

℞. *Specier. Diambræ, Sweet Diamoſch, an.* ʒj. *Orange-peel and Root of candy'd Elecampane, Conſerve of Anthos, of Flowers of Sage and Baum, an.* ʒs. *Syrup of Elecampane,* q. ſ. *for a Conditement.*

XV. Let him keep a good Diet upon Veal, Lamb, young Mutton, Pullets, Rabbets and Partridges, *&c.* The Broths of which, muſt be prepar'd with Roſemary, Borage, Baum, Betony, Hyſſop, Calamint, creeping Thyme, Leaves of Lawrel, Root of wild Raddiſh, Rinds of Citron and Oranges, Seeds of Aniſe and Fennel, Nutmeg, Cinnamon, Cloves, Ginger, *&c.* Alſo gravelly River-fiſh, Turneps and new-laid Eggs. His Drink midling Ale, with a little Wine at Meals. Moderate Sleep and Exerciſe, and a ſoluble Belly.

THE

THE CURES OF THE Chief Diſeaſes OF THE LOWER BELLY. WITH THE CASES OF THE PATIENTS IN THREE HISTORIES.

HISTORY. I.

Of a Preternatural Ravening Hunger.

A Young Man, twenty eight years of age, of a healthy Conſtitution, but ſomewhat Melancholy, and a great Lover of hard, ſalt, and acid Diet, was ſometimes ſeized with a very great and extraordinary Hunger, ſo that unleſs he preſently drank two or three Draughts of ſtrong Ale or Wine, and eat a piece of Bread or other Meat, he complained of a Dimneſs of Sight, accompanied with a ſlight *Vertigo*, and preſently became ſo weak, that not being able to ſtand, he fell into a Swoon. From which, when he recovered, and had refreſhed himſelf with Bread and Wine, he continued free from that exceſſive Hunger for ſome days. This Diſtemper ſuddenly

came upon him, sometimes in the Morning when he was fasting; sometimes an hour after Meals, before his Stomach was well emptied, without any Nauseousness or Vomiting.

I. THE Stomach of this Man was affected in the upper Part of the Stomach: and the Disease is called *Bulimus*; *Which is a Preternatural and Insatiable hunger seizing a Man on a suddain with Weakness and Swooning.*

II. The remote Cause was a Melancholly Disposition of the Body, and such a Dyet as somewhat vitiated the Concoction of the Spleen; which bred many sharp and Acid Humors in the Body ill concocted by the Spleen, which being carried to the Ventricles, and adhering to the upper Part of it near the Stomach, twich'd it after a peculiar manner, and by means of a certain acid Distemper and Constriction caused an extraordinary Hunger.

III. The swooning follows together with a notorious weakness, because of the great consent between the Stomach, the heart and the Brain, by means of the vagous Nerves, which are inserted into the Stomach, and upper Part of the Ventricle, with infinite little Branches; which being ill affected about the Stomach, by Sympathy, the Heart and Brain are affected. Now the Brain being affected, presently the Animal Spirits were disturbed, which caused the dimness of Sight, and the Vertigo. The same disorderly and sparing Influx was the occasion of the weakness and faintness of the Heart, which is the reason it makes lesser Vital Spirits, and sends a lesser quantity of Arterious Blood to the Heart.

IV. Now whether a few hours after Meals or Fasting, tis all one; for at whatever time that subacid Juice flows into the Ventricle, and knaws the upper Part of it, that vehement Hunger seizes.

V. The Patient is so corroborated with strong Ale or generous Wine, and the Distemper is presently mitigated, because such sort of Liquor refreshes both Animal and Vital Spirits, and washes off, nay sometimes concocts and digests the acid Humor sticking to the Tunicles of the Ventricle, and breaks the sowre Force of it, till there be a sufficient quantity of the same Humor collected again to make the same Vellication.

VI. The danger of this Distemper is, least the Patient should be seized at any time with this raving Hunger, where Meat and Drink are not to be had, and so should be carry'd off in a Swooning Fit.

VII. Therefore a Person thus affected ought never to Travel without a sufficient Provision of strong Wine and Food along with him; that he may have his Weapons ready to resist the suddain Invasion of his Enemy.

VIII. Moreover let him be gently Purged with Electuary of *Hiera Picra*, *Cochia* or *Ruffi. Pills*, avoiding strong Purgations: or if he be easie to Vomit, let him take a Vomit of *Asarabacca.*

IX. To strengthen the Ventricle and Spleen, and mend Concoction, let him take this Apozem.

℞. *Roots of Elecampane, Tamarisch, Capers an.* ʒ vj. *Galangal* ʒ ß. *Germander, Dodder, Agrimony, Ceterach, Baum an.* M. j. *Leaves of Lawrel,* M. ß. *Orange Peels* ʒ ß. *Juniper-berries* ʒ vj. *Fennel-seed* ʒ ij. ß. *Blew Currans* ʒ j. ß. *Water and Wine equal Parts. Make an Apozem of* ℔ j. ß.

To the same purpose also, let him take this Conditement.

℞. *Specier. Diambræ, Abbots Diarrhodon an* ʒ j. *Elecampane Roots and Orange Peels Candy'd, Conserve of Anthos and Flowers of Sage an.* ʒ ß. *Syrup of Elecampane* q. ß. *For a Conditement.*

X. Let his Dyet be of good and easie Nourishment and Digestion. Mutton, Lamb, Veal, Pullets and River-fish, the Broaths of which must be prepared with Rosemary, Betony, Anise and Fennel-seed, Nutmegs, Cloves, Wild Carrots, *&c.* Let his Drink be clear Ale, and middling Wine. Moderate Exercise and Sleep.

HIST.

HISTORY. II.

Of a Canine Appetite.

A Maid about Thirty Years of Age, of a Melancholy and somewhat Pensive Disposition, accustomed to Salt, Acid, Sowre, smoaked Meats of hard digestion, for a whole Year was troubled with an insatiable hunger without Swooning. All manner of Victuals she devoured most greedily, but drank moderately after it; when her Belly was full, her hunger never ceased, but was somewhat abated. After eating she flung up all again, which in a short time became so Sowre in her Stomach, that the Sowre smell offended the standers by; and the Maid her self confess'd that they came up sharper then juice of Limons. After that Evacuation she fell to again, and then again brought up what she had eaten: and day and night she would have done nothing but eat and Vomit, had not her Poverty enjoyned her a most troublesome and tedious abstinence, in the mean time however she grew very Lean.

I. THIS Distemper is called *Canina Appetentia*, or a Cane or Dog-like Appetite, *Which is an unsatiable Hunger without swooning proceeding from an acid ill Temper of the Inferior Stomach: wherein the Nourishment so greedily devoured is presently cast up again, and then other Nourishment devoured without any abatement of Hunger.*

II. It differs from a *Bulimia*, for that there is a Prostration of the strength without Vomiting; but many times with Swooning; in the other there is Vomiting without any signal weakning of the Body.

III. The Ventricle of this Maid was affected, especially in the lower Part.

IV. The containing Cause is an acid and viscous Humor bred through the defect of the Spleen, and infused in the Ventricle, which vellicating the Ventricle with it's acidity, causes an insatiable Appetite after all sorts of Nourishment to appease that Vellication. Which Nourishment being infected by the Humors with the same acidity, causes the Vellication to be more troublesome; upon which great plenty of Spirits being determined to the Inferior Fibres of the Ventricle, causes a Contraction of the lower Tunicles of the Ventricle, and so by the help of the Muscles of the *Abdomen*, a strong Expulsion of the Nourishment received: which not being able to dissolve or eject the acid Humor, still firmly impacted in the Tunicles of the Ventricle, which is rather fomented by the Spleen, it happens that the same raging Hunger still continues after Vomiting.

V. There is no Swooning in this case, becaus there is no great consent between the lower Part of the Ventricle and the Heart and Brain.

VI. Because this Raging hunger accompany'd with Vomiting, hinders due Nutrition, and Atrophy and wast of the Natural strength is to be feared.

VII. In the Cure the Body is often to be Purged with *Aloes*, *Hiera Picra*, Infusion of *Agaric*, and other bitter things, and two or three Vomits with Leaves of *Asarabacca*.

VIII. Then such things are to be prescrib'd, which corroborate and cleanse the Ventricle and Spleen, and promote Concoction by consuming the acid Crudities, such as are prescribed against the *Bulimia*; and the same Dyet must be observed.

HISTORY. III.

Of Difficult Concoction of the Ventricle.

A Certain Person Forty Years of Age, accustomed to Salt, Smoaked, Acid Meats, and of hard Digestion, after he had struggled with a Quartain Intermitting Ague for Eight Months, at length being freed from that, slowly recovered strength because his Ventricle difficultly digested the nourishment which it received: for that after Meals he was troubled with a great distention in the Region of the Ventricles, and Hypochondriums; which was eased sometimes by sending forth violent and loud Belches; and the fewer of those he sent forth, the more he was troubled. Sometimes he did not belch at all; and then he felt his Meat to fluctuate in his Stomach, and the next day he threw it up raw and unconcocted, with some relief of his trouble; and so he remained free as long as his Stomach was empty: but after feeding the same molestation returned. His Urine was thick and pale, with a copious sediment, thick and palish. No Fever could be perceived; but his Pulse was weak and unequal, and his natural strength decay'd.

I. HERE the Ventricles, which performs the first Concoction and Chylification was infected; which occasioned a difficult Concoction of the Nourishment by the *Greeks* called *Δεσπεψία*, proceeding from a cold ill Temper of the Ventricle and chylifying Bowels.

II. The Proximate Cause of this Evil, is the unaptness of the Ferment, to promote fermentaceous Concoction in the Ventricle, by reason the subacid and saltish Particles of it are less fixed, and not reduced to that fluxibility and tenuity, as to penetrate the Particles of the Aliments, stir up the Spirits latent therein, and separate them from the thicker mass.

III. That defect of the Ferment is contracted through the depraved and over-cold disposition of the chylifying Bowels, the Liver, Spleen and Sweetbread; for which reason they do not sufficiently concoct the Ferment which is to be prepared, nor reduce it to a due fluxibility and tenuity; but make it over-fix'd and crude; which being communicated to the whole Body begets Crudities, 1. In the Blood, which is therefore difficultly and unequally dilated in the Heart, so that few and those thicker both Vital and Animal Spirits are generated, whence a decay of Strength and dejection of the Mind. 2. In the Salival Kernels of the Chaps, and others of the Head, where the fermentaceous salival Juice being bred raw, and so falling into the Stomach, becomes unfit to make a due Fermentation of the Nourishment. And the same is to be said of all the other fermentaceous Juices flowing through the Choler-receiving and Pancreatic-Channel into the *Duodenum*, and thence in good part ascending to the Ventricle to promote Concoction. Which is the reason they make no Fermentation, so that the Nourishment fluctuates in the Stomach, and is vomited up raw. Or else they only cause a flatulent dilatation of the Aliments, whence a great distention of the Ventricle, the occasion of those loud Belches, by reason of the Viscosity of the crude Matter therein contained.

IV. The deprav'd disposition of the chylifying Bowels was contracted by disorderly Diet, and the long use of Meats thick, sharp and hard to be digested; out of which an unconcocted Chylus, and out of that a crude and not easily dilated Blood was generated, which being carry'd to the chylifying Bowels could not be master'd conveniently by them, and so by degrees they became debilitated and vitiously disposed.

V. By reason of an ill concocted Chylus, and the crude humors collected and bred in the Ventricle, it acquir'd a cold ill Temper, which render'd it unable to perform its duty, by bringing the fermentaceous Matter sticking to its Tunicles, to any farther perfection.

VI. A great part of the Flegmatic humors abounding in the Blood passes through the Reins, hence the Urine becomes

comes pale and thick, and the ſediment like it.

VII. There is no Fever, becauſe no Putrefaction, nor exceſſive Sulphureous Effervescency.

VIII. This is a dangerous Diſeaſe, becauſe it threatens an utter decay of the natural ſtrength for want of Nouriſhment.

IX. In the Cure, the Body is to be often purged with *Hiera Picra, Diaphœnicon, Cochiæ Pills*, Infuſion of *Agaric* and the like.

X. Then this Apozem is to be preſcribed, of which he is to take three or four times aday.

℞. *Roots of Elecampane, Calamus Aromatic an.* ℥j. *Roots of Zedoary and Tamariſchi an.* ℥ ſ. *Germander, Dodder, Baum an* M. j. *Leaves of Lawrel, Marjoram an* M ſ. *Juniper-berries, Orange-peels an* ℥ ſ. *Aniſe and Fennel-ſeed an.* ʒ ij. *Raiſins cleanſed* ℥ j. *Water and Wine equal parts. Make an Apozem of* ℔ j ſ.

XI. The Stomach and other Bowels are to be corroborated with ſome ſuch Conditement.

℞. *Ginger condited, Candied Elecampane root, Candied Orange-peel, Conſerve of Anthos and Flowers of Sage an.* ℥ ſ. *Oyl of Juniper* ℈ j. *of Aniſe*, gut. viij. *Oyl of Cinnamon and Cloves an.* gut. j. *or* ij. *Syrup of Elecampane* q. ſ. *For a Conditement.*

XII. If after this the Diſtemper do not abate, give the enſuing Vomit.

℞. *Leaves of green Aſarabacca* ʒ iij. *Rhaddiſh water* ℥ ij. *Squeeze out the Juice according to Art; then add, Vomitive Wine* ʒ jij. *Oxymel of Squils* ℥ ſ.

XIII. Then Prepare a Medicated Wine, of which let him drink a draught every Morning, between whiles taking a ſmall quantity of the foreſaid Conditement.

℞. *Roots of Elecampane* ℥ ſ. *of Zedoary* ʒ ij. *Germander, Marjoram, Carduus Benedict. an.* M. ſ. *Orange-peels and Juniper-berries an.* ʒ iij. *Aniſe and Fenel ſeed an.* ʒ j. *Cloves, Cinnamon an.* ℈ ij. *Lucid Aloes* ℈ iiij. *Hang them in a bag in* ℔ iiij. *of White wine.*

XIV. Forbear Pork, pickled and ſmoaked Meats, but obſerve a Diet of good juice and eaſie Concoction prepared with Horſe Radiſh-root, Majoram, Roſemary, Sage, Lawrel-leaves Aniſe and Fennel-ſeeds, Pepper, Cloves and Spices. Let his Drink be middle Ale and Wine, and ſometimes after Meals, let him take a ſpoonful of Spirit of Wine, or *Matthiolus's Aqua Vitæ*. Let him ſleep and exerciſe moderately; and let him ſometime anoint the Region of the Ventricle and Hypocondriums with Oyl of Nutmegs, and cover it with the Skin of a Vulture or Wild Cat: and let the Excrements of his Body be duly and regularly evacuated.

HISTORY IV.

Of a Hypochondriacal Paſſion, with a Nauſeating and Vomiting.

A Young Man in the Flower of his Age accuſtomed to hard, ſalt and acid Food, living an idle Life, for a long time nauſeating ſome ſorts of Nouriſhments, ſometimes had no Stomach, ſometimes had too much, but with difficulty retained and digeſted the Aliment received, with rumbling diſtention and pain in his Stomach, and many times was cruelly griped in his Guts, and all the lower Part of this Belly with an extraordinary rumbling. But theſe Evils were for ſome time abated by the copious breaking of Wind upward and downward. Sometime a ſaltiſh Liquor was wont to void it ſelf at his Mouth, with an extraordinary nauſeating and a ſlight Vomiting, eſpecially in the Morning, though it many times happened at other times of the day, and upon that evacuation he was ſomewhat better. But about a Month ſince all theſe ill accidents began to grow worſe. For his

Vomiting

Vomiting was often and violent, so that he threw up whatever he swallowed with a great force; which though they had not been long in his Stomach, yet they came up very acid, and which was more to be admired, sometimes after dinner he brought up two or three ounces of a transparent Liquor only, as he said himself, Saltish and Sowrish. Yet he retained both his meat and drink, and after that Liquor was come up, retained and digested them very well; when he did not Vomit, the Gripings and Rumblings of his Belly were more troublesome. He had no Fever but was thoughtful and sad; several Scorbutic Spots appeared also upon his Skin, and his Body waxed lean.

I. HERE several Parts were ill affected, chiefly the Stomach, Guts and Sweetbread.

II. This Disease is called a *Hypocondriacal Affection, which is an acid ill Temper of the Sweet-bread, Ventricle, Intestines and Parts adjoyning.*

III. The Primary cause proceeds from a saltish and acid ill Temper of the Sweet-bread, contracted by irrigular Diet, by which the Pancreatic Juice became too salt and acid, and that at one time more then another, according to the nature of the Aliments received into the Stomach.

IV. This Juice flowing out of the Sweetbread into the *Duodenum*, and ascending good Part of it into the Ventricle, corrupts the Ferment of it, and so causes bad Concoction: But if it fall into the Stomach infected with any stinking and depraved quality, then it causes loss of Appetite and nauseating, and sometimes vomiting. But if it flow in over acid, then it begets outragious hunger.

V. From this vitious Concoction and Fermentation arise Distensions, Pains, Rumblings, and much Wind, which being belched upward, in some measure abates the Distention.

VI. But if that vitious Juice fall altogether down to the Intestines, then the Decoction is better, the nauseating less; However a vitious Effervescency excited in the Guts, from whence Wind, Rumblings, Roarings, Pains and Distensions of the Intestines.

VII. The Liquor flowing out at the Mouth with a nauseousness is the Pancreatic Juice carried up to the Head, and through nauseousness ejected out at the Mouth together with the Salival Liquor.

VIII. Which Pancreatic Juice growing afterwards more sharp and deprav'd, and more violently twinging the Stomach, causes a frequent and violent Vomit. Which if it happen after Meals to break forth through those Aliments into the upper Part of the Stomach, as it causes a great nauseousness alone, is vomited up alone, the Aliments remaining in the Stomach, where they are well digested, that vitious Ferment being Evacuated.

IX. There is no Fever because no Putrefaction.

X. He is thoughtful and sad, for that by reason of the acid Humors mixed with the Blood, the many Animal Spirits are generated somewhat thicker in the Brain, so that they do not pass so chearfully and orderly through the narrow Pores of the Brain, which makes the Patient thoughtful and musingly Melancholly.

XI. The Body is emaciated, because the first Concoction is not well performed, which infects the Blood with a Scorbutic quality, that renders it more unapt for Nutrition.

XII. This Disease is dangerous for fear of an absolute Atrophy, and Consumption of the Natural strength.

XIII. Therefore in the Cure let the Patient be Purged once in eight days, with an Infusion of Senna, Agaric, *&c.* adding thereto a little *Electuar.* of *Hiera Picra* or *Diaprunum*: or with *Chochia Pills, Extract* of *Catholicon, Powder* of *Diaturbith* and the like. Blood-letting signifies little in this Case where there is no Fever.

XIV. If his inclination to Vomit continue, give him some such Vomitory.

℞. *Fresh Leaves of Asarabacca* ʒ iij s. *Radish-water an.* ʒ ij. *squeez out the Juice, then add Antimoniate Wine* ʒ iij. *Oxymel of Squills* ʒ s.

XV. Let him take three times a day some convenient Apozem, like this that follows.

℞. *Roots of Tamarisch, Capers, Polypody*

of

of the Oak, Elecampane an. ʒ vj. *Germander* M. j. ſ. *Baum, Betony, Borage, Dodder an.* M. j. *Leaves of Lawrel, Water Trefoyl an.* M. ſ. *Orange-peels* ʒ vj. *Aniſe and Fennel-ſeed an.* ʒ j. ſ. *Raiſins cleanſed* ℥ ij. *Water* q. ſ. *Make an. Apozem to* ℔ j. ſ.

XVI. Between whiles let him take a ſmall quantity of this Conditement.

℞. *Roots of Elecampane, Orange-peels Condited, Conſerve of Borage, Baum, Flowers of Sage an.* ℥ ſ. *Oyl of Aniſe drops* xij. *Syrup of Elecampane* q. ſ.

XVII. In a great diſtention of the Maw and Inteſtines, with Faintneſs and Pain, ſuch a Bolus will be very proper.

℞. *Treacle* ʒ j. *Crabs Eys prepared* ϑ j. *Oyl of Anniſe drops* iiij. *Mix them for a Bolus.*

XVIII. Inſtead of his Apozem ſometimes in a Morning faſting, give him a Doſe of this Powder in Ale or Broth.

℞. *Crabs-Eyes prepared* ʒ ij. *Red Coral prepared* ʒ ſ. *Amber prepared* ʒ ſ. *Make a Powder to be divided into four Doſes.*

XIX. Let his Diet be of good and eaſily digeſted Nouriſhment, avoiding all dry'd, ſmoak'd, acid, ſowre, rank and crude Victuals. Let his Drink be ſound ſtale Ale, and ſmall Wine but not acid. Let him Sleep and Exerciſe moderately, and evacuate duly and regularly.

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